
POPULATION

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The Limits to Low Fertility: A Biosocial Approach

CAROLINE FOSTER

MOTHERHOOD AND APPLE pie are, famously, things it is deemed impossible to be against. Since the 1960s, however, the countries of the industrialized world have experienced the lowest levels of fertility ever recorded for large populations, with total fertility rates (TFRs) generally dropping below the replacement level of 2.1 children per woman. By the late 1990s the TFR stood at 1.3 or below in a number of southern and central European countries.¹ Globally, 61 countries have fertility rates at or below replacement level, and the combined population of those countries—2.6 billion in 1998—constitutes 44 percent of the world's population. Although fertility has continued to fluctuate within a fairly narrow range, in 20 developed countries, including the United Kingdom, the TFR has now remained at below-replacement level for more than two decades.

With TFRs hovering around 1.2 in Spain and Italy and 1.3 in Germany, and voluntary childlessness an increasingly salient phenomenon (Foster 1998), a question of concern to demographers today, as it was in the 1930s, is how low fertility can fall and whether, given true choice in the matter for the first time in their history, humans might cease reproducing altogether because of the very high physical, psychological, temporal, and financial costs involved in raising children for the required 20 years or so. The problem of why adults with choice in the matter continue to have children at all and, if they do so, whether it should be two children on average, is attracting increasing attention (e.g., Golini 1998; Namboodiri and Wei 1998; Potts 1997).

Demography draws on a variety of disciplinary approaches for theoretical explanations of the behavioral phenomena that underlie demographic data. Demographers studying reproductive behavior in post-transitional, industrialized societies have for the most part based their work on models derived from either sociocultural or microeconomic theories of the family.

Proponents of the sociocultural models (including Lesthaeghe 1995; van de Kaa 1987) emphasize socialization processes and the values and attitudes of individuals and communities toward marriage and childbearing. Microeconomic theories, first formulated by Leibenstein (1957) and Becker (1960, 1981) and subsequently developed by many others, including Willis (1973) and Ermisch (1996), have until recently provided the dominant model, focusing on direct and indirect costs and benefits associated with children and on the resources available to couples to achieve their desired family size. Namboodiri and Wei (1998), surveying the range of theoretical frameworks applied by demographers to the study of reproductive behavior, found that most of the models implied a lower limit to fertility of zero. Similarly, Keyfitz (1987) found that all the explanations given for increasingly low fertility in modern societies imply that fertility is likely to continue to decline gradually toward zero.

A key question in this context is whether a biological component to fertility motivation, ignored by the sociocultural and microeconomic models (and by definition excluded from the “rational choice” theory of decision-making on which the latter are based), may be salient in ensuring that humans continue to reproduce. Biological variables are usually treated as randomly distributed and insignificant with respect to the social and economic determinants of fertility. This stance ignores any possible “baseline” of biological fertility motivation, potential variability in the biological desire to reproduce, and possible interactive effects between biological and social variables, all of which could be instrumental in setting limits to low fertility.

A number of demographers have begun to examine recent developments in the biological sciences, in particular evolutionary biology and behavioral genetics (Hobcraft and Kiernan 1995; Kohler, Rodgers, and Christensen 1999; Morgan and King 1998; Potts 1997; Udry 1996), as a means of examining the hypothetical existence of a variable biological contribution to fertility motivation. Not a great deal has yet been published, but several papers addressing this question were presented at a recent conference on low fertility at the Max Planck Institute for Demographic Research in Rostock, Germany. The results are inconclusive, with no comprehensive theory developed as to the ultimate evolutionary causes, evolutionary context, and proximate mechanisms of motivations for fertility.

This article, drawing on evidence from evolutionary biology, ethology, developmental psychobiology, and psychology, takes a somewhat different approach from that of the authors mentioned above. It hypothesizes that our evolved biological predisposition lies in inherited nurturing behaviors, rather than in having children per se, and that such nurturing behaviors begin to manifest themselves in infancy in response to environmental stimuli. A wide range of empirical evidence is provided to support this hypothesis.² The article suggests that humans have the unique ability, through

their highly developed cerebral capacities, to be conscious of such biological predispositions and translate them into conscious, but biologically based, fertility motivation. It concludes that this “need to nurture,” although individually variable, subject to environmental influences, and sexually dimorphic, is sufficiently strong to ensure that the majority of women will, other things being equal, want to bear at least one child, despite the substantial costs of so doing. If this hypothesis is true, then it is highly probable that we have already reached the limits to low fertility. Finally, the article provides a sketch for a biosocial model of fertility motivation.

Evolutionary biology and human behavior

Demography, like other social sciences, is slowly coming to terms with two important truths that the biological sciences have proved beyond any doubt: first, that the human mind is as much a product of biological evolution as is the human body; and second, that human behavior is strongly rooted in, although not solely determined by, behavioral predispositions handed down genetically over the course of evolutionary history. Until recently the social sciences paid scant attention to the biological sciences, since the dualism with which the Western cultural tradition is imbued (as expressed in such common pairs of “opposites” as mind/body, material/spiritual, physical/mental, biological/cultural) was an integral part of their conceptual foundations. The essence of this approach to human behavior is the Durkheimian view that social phenomena form an autonomous system, which can only be explained by other social phenomena; this approach is in direct descent from Locke’s idea of the human infant as a “tabula rasa,” on which culture is imprinted from outside, with the implication that all behavior must be learned.

In recent years, however, the rapidly developing disciplines of evolutionary biology, evolutionary psychology, and behavioral genetics have inflicted considerable, if not fatal, damage to the strictly dualist foundations on which the social sciences have heretofore rested. Central to these disciplines is the idea that there is no clear-cut divide between the mental and the physical, the psychological and the biological; rather, mental and physical states are two aspects of the same phenomenon. Evolutionary biology puts the human species in its evolutionary place, as one species (albeit with some extraordinary intellectual features) among others, evolved both structurally and behaviorally from common ancestors over hundreds of millions of years. It enables us to identify both the behavioral traits we share with our close genetic relatives and the factors that make many aspects of human behavior unique.

Evolutionary psychology, which uses contemporary evolutionary theory as “a conceptual framework or metatheory for the study of psychological processes and mechanisms” (Daly 1990: 25), has begun to show that

while individual human behaviors cannot be regarded as genetically determined, much of our psychological “architecture” is in fact genetically specified and so, consequently, are ranges of possible behaviors, although not particular behavior in a deterministic way. Further, in complex behavior there is no clear-cut distinction between instincts, or innate behavior, and learned behavior: rather, complex behaviors develop via a continuing interaction between genes and environmental stimuli. Put simply, we are born predisposed to learn certain things and to develop certain types of behavior in response to certain stimuli. Outcomes, however, are contingent rather than necessary, highly variable, and complicated by human consciousness, the ramifications of which are still poorly understood. In addition, modern humans live in environments hugely different from the hunter-gatherer societies in which our behavioral predispositions evolved. This fact means we must be cautious about explaining current human behavior in terms of its contribution to “reproductive fitness,” a concept that has limited applicability to present-day human industrial societies. Behavioral genetics, still in its infancy, is making rapid progress in identifying the genetic basis of the range of possible behaviors (Plomin and McClearn 1993), with major developments in such areas as cognitive abilities and disabilities (Plomin and Craig 1997).

It is no exaggeration to say that modern biological sciences are bringing about a revolution in our thinking about the mind/body relation in humans and, consequently, making it necessary to reevaluate the dualist foundations of the social sciences. Tooby and Cosmides (1992: 21), in an impressive dissection of the “standard social science model,” have effectively written the epitaph of the strictly dualist biological/social dichotomy: as they succinctly put it, “this dualistic view expresses only a premodern view of biology, whose intellectual warrant has vanished.” It is therefore important for demographers to assess, albeit with caution, whether insights gained from the biological sciences may have heuristic value in our attempts to understand human behavior.

The joy of sex

As mentioned earlier a number of demographers have begun to examine the idea that there may be some variable biologically based element in fertility motivation. Udry (1996: 329), for example, who has argued for incorporating biosocial models into demography, suggests that there may be “a biological basis for motivating behaviors that lead to childbearing.” He argues that because women historically had little choice in the matter of bearing children, such motivations would not have been intensely acted upon by natural selection in the manner of other behaviors related to reproduction. They would thus continue to exhibit considerable genetic variation

between adults, which has finally become visible because efficient contraception allows for reproductive choice. Kohler, Rodgers, and Christensen (1999: 254) proposed the similar argument that genetic influences on fertility “are most relevant when the number of children results from a deliberate and conscious decision” and attempted to quantify such influences using time-series data on the fertility of Danish twins.

Although these authors and others agree that there is likely to be some biological motivation toward childbearing, they do not advance clear hypotheses as to either the ultimate causes or the proximate mechanisms (to use the terminology of evolutionary theory) of such motivations. They have also failed to grasp the fundamental point that there was no evolutionary need to code genetically for any kind of “motivation” toward childbearing, because childbearing resulted directly from sexual intercourse. The fact that humans have a strong genetic predisposition toward sexual intercourse, mediated by hormones, is documented beyond doubt, and it is entirely non-controversial that the enjoyment we take in sex was, until very recently, Nature’s way of ensuring that we have children. As Potts (1997: 4) succinctly puts it, since “[h]uman beings evolved from less intelligent animals with a stand-alone sex drive not consciously related to pregnancy,...it would seem redundant for evolution to have added any additional behavioral mechanisms.”

One should remember the extreme parsimoniousness of natural selection, which never incurs extra costs by developing a complex genetic mechanism when a simple, albeit clumsy one will achieve the desired result. For example, in many species of animals and birds the need for kin recognition (mothers recognizing offspring, and vice versa) is satisfied by a simple proximity rule rather than by more complex genetic coding, because in the overwhelming majority of cases such a rule will suffice (Grafen 1990). We are familiar with the way baby ducks bond to the first moving object they see, occasionally with comical results when they bond to a person or a dog. Over evolutionary time, however, that moving object has almost always been their mother, which is why the genetic mechanism is unsophisticated. Similarly, there was never any need to develop a genetic mechanism more complex than sexual urges to ensure that people reproduced themselves, and motivation toward parenthood per se was, in evolutionary terms, redundant.

On the other hand, the evolutionary development in humans of complex social behavior and very large brains resulted, over time, in offspring that were born with their brains only partially developed and thus unable to survive for a considerable time after birth without constant attention from a highly motivated caregiver. Foley (1995: 27) points out that the high level of effort required from mothers in bringing up their offspring is a special characteristic of humans: “Energetic investment in pre- and post-natal pe-

riods is high, parturition is difficult and associated with high levels of infant and maternal mortality, interbirth intervals are long, weaning age is late, and childhood dependence is prolonged.... Emotional and psychological involvement between mother and offspring is pronounced and protracted. The evolution of maternal strategies must therefore rank as one of the primary shifts in the overall process of human evolution.”

It was essential that all humans—and in particular females, who gave birth to and took primary responsibility for offspring—have a strong genetically based predisposition toward nurturing behaviors. A great deal of evidence may be adduced for such a predisposition in humans and many other species whose offspring require extended care. This predisposition takes a particularly interesting form in humans, who are the only species to have any choice about reproducing, as well as the only species consciously aware of its biological predispositions. This predisposition to nurture is, I would argue, the biological basis for “reproductive motivation” and is separate from the hormonal influences on maternal behavior that manifest themselves during pregnancy and after parturition. Morgan and King (1998: 3) make a superficially similar suggestion, but they argue for a predisposition to nurture “once kids arrive” and suggest that non-parents could anticipate these feelings only “in greatly diluted doses by observing others interacting with their children.” If this were the case, biological factors would only be activated once parenting had started and would play no part in reproductive motivation.

The basic hypothesis of this article is that low fertility in post-transitional societies is unlikely to fall any lower because women have a biologically based predisposition toward nurturing or maternal behavior that interacts with environmental stimuli, resulting, in most cases, in a conscious motivation for bearing at least one child. Perhaps the greatest barrier to the acceptance of the idea that we have biological predispositions to certain sorts of behavior is the widespread but erroneous assumption that such predispositions must necessarily be both identical in every human being and immutable. Thus, the existence of women who do not wish to have children or who fail to show nurturing behavior to children is taken to disprove the existence of a “maternal instinct.”

What must be understood here is that evolution deals with variation and individual differences, and complex genetic traits in particular (i.e., those governed by more than one gene) display considerable variation between individuals, with most individuals exhibiting middling values of the trait and a few individuals showing very high or low levels. The expression of these traits is also heavily influenced by environmental factors. Thus, under the rubric of maternal instinct can be found some individuals with little or no predisposition to nurture, and others with extreme propensities toward nurturing. In either case these predispositions may be positively or negatively reinforced during the development of the individual, leaving outcomes highly

unpredictable, whatever the strength of the underlying genetic predisposition. In short, since nurturing is not an “all or nothing” phenomenon, is subject to considerable environmental influence, is subject to strong hormonal reinforcement after a child is actually born, and is one of many genetic traits contributing to reproductive success, I would argue there is room for considerable variation in the levels of general nurturing propensities without affecting reproductive success sufficiently to need strict definition by natural selection. Empirical evidence for the existence of discernible individual variation in nurturing behavior is given below. In the next two sections I consider the behavioral and genetic evidence for the existence of complex genetic traits predisposing humans toward nurturing behavior.

The foundations of maternal behavior

We have seen that the extremely slow development of human infants and their consequent extended period of helplessness require a long period of highly motivated caretaking. Certain parental behaviors evolved to ensure the survival of species with highly vulnerable and not wholly developed offspring. As Eisenberg (1990: 14) puts it, “Parenting is the final phase in an integrated sequence of reproductive behaviors sculpted by selection to ensure the continuity of the genome”; parenting behaviors of various kinds and degrees are found in a wide range of species whose young are not born self-sufficient, and in their most long-lasting and developed forms in mammalian species, particularly humans. The idea of an innate maternal instinct has received a great deal of scorn from social scientists who argue that gender roles are merely cultural constructs, and that gendered behavior is simply learned, with no innate basis. Thus the feminist Adrienne Rich (1977: 12) writes that “Motherhood is earned, first through an intense physical and psychic rite of passage—pregnancy and childbirth—then through learning to nurture, which does not come by instinct.” Such criticisms, as explained above, are based on a fundamental misunderstanding of how genes and environment work together to develop behavior. Like many other genetically influenced behaviors, parental care is found in varying degrees in males as well as females, and can be modified both by perinatal hormonal influences and by the early experiences of the individual, in both humans and other species (Rosenblatt and Siegel 1981).

The predisposition toward nurturing in human beings becomes apparent very early in their development. Thus Hofer (1981: 283) describes how nurturing behaviors begin to manifest themselves in very small children: “most parents have observed their children behaving...parentally well before three years of age.... [P]arenting responses begin as affectional holding and physical attachment behaviors elicited by stuffed animals, dolls and younger siblings. More specific parental behaviors such as rocking, feeding,

caressing, play sequences, and baby talk are added as the child becomes capable of these.” There is evidence for special sensitivity and responsiveness to the human infant cry even in the earliest days of life, with the vocal properties of a newborn’s cry promoting crying in other newborns. By the end of the first year infants commonly respond to emotional signals in others by engaging in distress crying themselves (Radke-Yarrow, Zahn-Waxler, and Chapman 1983). A longitudinal study of children’s reactions to the distress of others found that attempts to comfort others in distress begin to appear between the ages of 12 and 18 months, including “tentative pappings or touching.” By 18–24 months of age these contacts become increasingly differentiated and frequent, and by two years of age children “bring objects to the person who is suffering, make suggestions about what to do, verbalize sympathy, bring someone else to help, aggressively protect the victim and attempt to evoke a change in affect in the distressed person” (Zahn-Waxler and Radke-Yarrow 1982). Similar evidence for the early appearance of nurturing responses was observed by Dunn and Kendrick (1979), who found that infants as young as 14 months old showed concern for their older siblings, demonstrating considerable understanding of how to comfort them. Radke-Yarrow, Zahn-Waxler, and Chapman (1983), reviewing research on prosocial development in children, conclude that prosocial behaviors (that is, behaviors that aid or benefit others) are present from infancy, with a gradually developing complex responsiveness to others’ needs and distress. Importantly from the perspective of genetic variation, they also note significant individual differences between children in their responses: “not all infants respond; some respond in the extreme.... [O]ne might speculate that such differences in thresholds could underlie later developmental differences in empathy and altruism” (Radke-Yarrow, Zahn-Waxler, and Chapman 1983: 480)

Until recently such behaviors were thought to be simply imitation or forms of play, but there is a growing body of evidence in the psychological literature (and parallel animal behavior literature) that these early precursors of parental and other behaviors are both genetically based and significant in the formation of adult behavior. These nurturing behaviors seem to develop gradually in an interaction between the genes that give the potential for such behaviors and the provision of environmental stimuli that elicit the behavior, and without which they will not develop properly. Maternal behavior has been extensively studied among the various primate species. About half of primate brain development takes place postnatally, and development of the neocortex continues throughout the time that infants experience maternal behavior and develop the skills necessary for social behavior, including interaction with peers, younger siblings, and infants. “Play mothering” behavior is observed in young primates of both sexes (Keverne 1995). Maternal behaviors in juveniles are not, however, simply elicited in

response to exposure to infants. The maternal care young primates have received from their own mothers also appears to be important; as Keverne (1995: 69) notes: "it is generally recognised that the prognosis for good mothering is poor if that individual received inadequate mothering herself." This observation is echoed in the human psychological literature; Fogel, Melson, and Mistry (1986) note the increasing evidence suggesting that childhood experiences are related to competency in caregiving in later life.

Although proximity to infants or other objects of nurturance is a necessary condition for nurturing behavior, it is not a sufficient one. As Berman (1986: 26) puts it: "attraction to babies is an important precondition for most, if not all of the behaviors with which we are concerned." The hypothesis that we are genetically predisposed to respond positively toward babies was first formulated by the ethologist Karl Lorenz (1943). He attributed an "attraction-to-babies" response to innate mechanisms, suggesting that such behavior is cued visually by seeing the distinguishing physical characteristics of infants. These include a head that is large relative to body size and a forehead large relative to facial size, along with large eyes, round cheeks, and soft skin. Lorenz hypothesized that such infant characteristics act as "releasers" for specific unlearned emotional and motor responses (Lorenz 1943, 1971).

More recent research on the developmental psychobiology of humans shows not only that Lorenz was essentially correct, but also that the infant is born equipped to provide behavioral as well as visual cues to elicit caretaking behavior; thus Hofer (1981: 304) comments: "The view of the infant that emerges from recent developmental work is that of a surprisingly competent creature, preadapted to have considerable power to interact with its environment and to manipulate its caretaker by its behavior. It is able to affect its mother even during sleep by smiling and sucking and evokes a whole system of parental behavior in its caretaker through the features and rhythms of its behavior as well as through its special physical characteristics." This type of evolved cue-response system is directly analogous to what in the study of animal behavior is termed "signaling"; a vast amount of ethological literature is devoted to this response system, most recently focusing on how such signals coevolve between sender and receiver, usually to the mutual benefit of both organisms (e.g., Krebs and Davies 1993).

Women and girls, however, seem to be much more responsive to these signals from infants than are men and boys: studies across cultures and ages have found sex differences of large magnitude in levels of interest in, and nurturant behavior toward, infants and young children. Girls are significantly more likely than boys both to care spontaneously for younger children and to show prosocial behavior toward infants (Maccoby and Jacklin 1974). Females of all ages, when shown photographs of babies, also demonstrate greater attraction to infants than males do (Berman et al. 1978;

Feldman and Nash 1978; Feldman, Nash, and Cutrona 1977; Fullard and Reiling 1976; Nash and Feldman 1981). A number of studies, both observational and experimental, provide supporting evidence that girls are much more likely than boys to interact with infant siblings or unfamiliar infants, and to do so in an overtly nurturing way (Berman and Goodman 1984; Berman, Monda, and Meyerscough 1977; Berman, Smith, and Goodman 1983; Blakemore 1981, 1990, 1991; Frodi and Lamb 1978; Melson and Fogel 1982). These behavioral differences were once widely believed to be merely the result of sex-role socialization, but there is now a large body of evidence, to which I allude in the next section, that both parental/nurturing behaviors and the sex differences shown in such behaviors are genetically based, although developed in conjunction with environmental input.

Nurturance in relation to giving care to children is usually thought of as “a combination of empathy, altruism and affection” (Fogel, Melson, and Mistry 1986: 54). If we define nurturance broadly as “giving care to those in need of care” (ibid.: 65), then it is obvious that human nurturing behaviors extend beyond the confines of the parent-child relationship, which includes the empathy, altruism, and affection that were originally developed by evolution simply to ensure the survival of offspring. Many people are devoted to nurturing pet animals and plants of all kinds. It has been suggested that in evolutionary terms the relationship of pets to humans is merely a parasitic one, but substantial evidence demonstrates the existence of considerable psychological and physical health benefits to the owners of pets (Wilson and Turner 1998); this in turn suggests that having something to nurture is a basic human need. While for the majority this need will be focused upon a motivation to have children, for the minority circumstances or preference may direct that it is fulfilled by other objects of nurturance. Given that we have a conscious awareness of the very high costs of childbearing and childrearing, and a genuine choice as to whether or not to reproduce, individuals with a weaker biological predisposition to nurture, and/or adverse personal circumstances, have the option of focusing their nurturance on, and receiving reciprocal affection from, less “costly” objects of nurturance. As Fogel, Melson, and Mistry (1986: 57) put it: “the human capacity to foster development is generalizable to a wide range of rather different endeavors, leading to the conclusion that different individuals may choose to display nurturant capacities in relation to different objects and in different styles.”

This implies that while in our environment of evolutionary adaptedness humans were genetically coded with a strong predisposition toward nurturing behavior that is elicited by the stimuli provided by babies, nurturing behaviors can also be elicited by many other living animals or plants in need of care. This observation gives an interesting perspective to the “selfish gene” argument (Hamilton 1964) that explains the evolutionary rationale for developing altruistic or nurturing behaviors toward offspring or other

kin simply as a way of increasing “inclusive fitness” by ensuring the survival of copies of one’s genes in genetically related organisms. As with the example of kin-selection mechanisms given above, natural selection seems to have assumed that simple proximity would ensure that nurturing behaviors are directed at the right recipients (i.e., those sharing the same genes). However, through our consciousness and highly developed cerebral capacities, evolution has delegated to humans the ability to choose between various behaviors for dealing with complex situations, in contrast to simple organisms living in relatively unchanging environments, whose behavior is merely reflexive. Thus our consciousness and intellect have given us the capacity to be aware of our behavioral predispositions (such as those to nurture) and to apply them to other objects in addition to our close genetic relatives.

Nevertheless, although modern-day humans often use this basic need to nurture in ways very different from those originally intended, the vast majority of women still choose to focus a large part of their nurturing capacities on children. Despite low levels of fertility and media stories about the growth of voluntary childlessness, an analysis of the OPCS statistics on which current high projections of childlessness for the United Kingdom are grounded shows that such forecasts are based on a very short-term trend and are thus purely conjectural (Foster 1998). The only recorded case of a total fertility rate for a country actually dropping below 1.0 occurred during the massive social, economic, and political disruption within the former East Germany after the fall of communism (Adler 1997).

Why, then, do women given the choice about objects of nurturance continue to choose the costly option of bearing children instead of limiting themselves to less costly objects of nurturance, such as pets? The answer is that while we are predisposed to respond to any helpless creature in need of care, women are particularly predisposed to respond to the signals given out by human infants and to find them attractive, as described above. The capacity for nurturing may be extensible toward other objects of care, but for very many women the conscious desire to bear and nurture a child of their own is very strong. This innate tendency is reinforced by environmental stimuli, both from exposure to real infants and from media images of infants. Finally, while stressing the importance of the underlying biological predisposition toward wanting to have children, we must also acknowledge the social pressures to do so: although voluntary childlessness is a much more visible phenomenon now than 20 or 30 years ago, there is still considerable evidence of normative pressure to bear children. Thus, Lampman and Dowling-Guyler (1995: 221) found that “planning to remain childless appears to make one vulnerable to a host of negative attitudes, including being viewed as lazy, insensitive, lonely and unhappy.” The interaction between biological predispositions and normative pressures in fertility decisionmaking is explored further below.

Hormones are not the only basis of maternal behaviors

What, then, has been discovered about the biological origins of the maternal and nurturing behaviors that are so readily elicited in humans and other species? It might be assumed that maternal behavior is simply “switched on” by hormones during pregnancy and after birth, and it is true that in all mammals secretions of the ovarian hormones estrogen and progesterone begin from the moment of fertilization to “prime” the mother physiologically for maternal care. In addition to physiological changes in the uterus, cervix, and mammary glands in preparation for parturition and lactation, the hormones also act centrally to prepare the brain for maternal behavior (Keverne 1995). However, there is a great deal of evidence from studies of many mammalian species, in addition to humans, that the etiology of maternal/nurturing behavior is not simply hormonal, and that its origins lie much further back in an individual’s life history, in a variety of genes that are “expressed” (or switched on) at different times during an individual’s development, beginning in infancy. The evidence for male as well as female capacities for parental/nurturing behaviors (albeit generally different in degree) underlines this point.

Rats and, more recently, mice have been the subject of the most extensive research on the psychobiology of mammalian maternal behavior. A large body of evidence demonstrates that species-typical maternal behavior in rats can be induced without hormones (Fleming 1990; Fleming and Rosenblatt 1974; Quadagno, Briscoe, and Quadagno 1977). If virgin female rats are continuously exposed to young pups for a week or more, they will show the same pattern of maternal behavior as is found in postpartum female rats, which show a spontaneous onset of maternal care. This behavior includes retrieving pups, intensive pup licking, adopting a nursing posture over the young, and building a maternal nest. This development of maternal responsiveness in virgin animals is termed “sensory induction of maternal behavior,” or sensitization, and cannot be regarded as learned or imitative behavior, because these species have extremely limited imitative capacities.

Once maternal responsiveness has been induced, whether by hormones or sensory induction, it has powerful, long-term behavioral effects (Fleming 1990). It should be noted, however, that the state of maternal responsiveness induced by sensitization is not as complete as that found in lactating females. It is thus highly probable that complete maternal responsiveness requires the appropriate hormonal input as well as stimulation from infants (Quadagno, Briscoe, and Quadagno 1977). Similar patterns of behavior have been found in mice and hamsters, and studies of sheep have shown that repeated exposure to lambs can stimulate maternal behavior in non-parturient, ovariectomized ewes in less than 24 hours (Rosenblatt and Siegel

1981). An important difference between species is that mice appear to rely less upon hormones than rats do to stimulate maternal care at parturition; virgin mice of many strains have been found to exhibit high levels of maternal care. This finding for mice is significant for the hypothesis outlined above about fertility motivation, for it gives us an animal model in which “the underlying basis of maternal behaviour is more robust with respect to genetic contribution and less dependent upon hormones for its expression” (Bridges 1998: 108).

There is a growing body of evidence, from both animal and human studies on the effects of perinatal androgens, for very early, even prenatal, developmental influences on the capacity to acquire maternal behavior. Mammalian fetuses are basically female at conception, and although the gonad is determined at conception by the sex chromosome of the sperm cell, the masculinization of the other internal reproductive organs and genitalia depends upon the production of male hormones, including androgen, by the testes. Since the brain plays an important part in endocrine function and sexual behavior, it is not surprising that functional and sexual differences in the brain are triggered by the influence of testicular hormones in early development (Gorski 1990). During early development, gonadal hormones can induce permanent changes in brain structure and function, and these perinatal hormonal influences have been found to affect nonsexual as well as sexual behavior patterns, including parenting behavior, in juvenile and adult rodents and primates (Quadagno, Briscoe, and Quadagno 1977).

Animal studies show that the effect of excess prenatal androgens on genetic females is to make them exhibit as adults typically masculine traits, such as aggression and high energy expenditure. Of particular interest here is some rare direct evidence from medical studies of human subjects suffering from congenital adrenal hyperplasia. Because of a genetic defect, individuals suffering from this syndrome are exposed prenatally to abnormally high levels of adrenal androgens (New 1985). The condition is usually diagnosed soon after birth, and androgen levels can be normalized by treatment with cortisol.

A number of studies have examined patterns of behavior in women exposed prenatally to abnormally high levels of adrenal androgens, with a range of evidence to suggest that both as children and as adults females with congenital adrenal hyperplasia show significantly less interest compared to controls in activities related to maternal behavior. Thus females with congenital adrenal hyperplasia play less often with dolls (Berenbaum and Snyder 1995; Ehrhardt and Baker 1974) and are reported by both their parents and themselves to have more interest in pursuing a career than in becoming a mother (Dittman et al. 1990; Ehrhardt and Baker 1974). In addition, when scored on two personality measures involving nurturant behavior, on which females typically score higher than males, females with

congenital adrenal hyperplasia score lower than controls (Helleday et al. 1993; Resnick 1982, cited in Leveroni and Berenbaum 1998). A recent study by Leveroni and Berenbaum (1998) directly tested the hypothesis that females with congenital adrenal hyperplasia have less interest in infants than controls. Comparing girls 3 to 12 years old affected with congenital adrenal hyperplasia to their unaffected siblings, they found the former to be significantly less interested in infants than their counterparts.

These findings strongly suggest that there is structural sexual differentiation of the brain in humans from the earliest stages of development, which is consistent with the model of the sexual differentiation of the brain derived from laboratory studies of the rat and other animals (Gorski 1990). Whether lack of interest in infants can be characterized as a specifically masculine trait is debatable, but given the negative effects of excess perinatal androgen on maternal behaviors in childhood, this structural sexual differentiation would seem to include a stronger genetic predisposition for nurturing behaviors in females. This notion is supported by behavioral evidence: while it is clear that males of many species, including humans, have some capacity for parental and nurturing behaviors, there is also clear evidence of sexual dimorphism in nurturing behavior starting at a very early age.

Thus significant differences exist between male and virgin female rats in the maternal behaviors elicited when the animals are continuously exposed to pups: both intact males and males castrated at 25 days of age show significantly lower levels of maternal behavior when compared to intact or ovariectomized females (Quadagno, Briscoe, and Quadagno 1977). Similarly, field studies of langurs and baboons show sexually dimorphic behavior patterns with regard to childhood interest in infants. Female juvenile langurs and baboons spend much of their time taking part in the care of infants with adult females, while the male juveniles play almost exclusively with other males of the same age group and pay little attention to infants (*ibid.*).

The genetic basis of maternal behavior

Although research into the molecular genetics of maternal and paternal behavior in mammals is still at an early stage, it is beginning to indicate that genes expressed at a number of key points in development lay the foundations for the parental care later exhibited, particularly in newly parturient and lactating females. The focus of recent genetic studies of maternal behavior has been on the underlying neurobiological behavior and the hormonal stimulation of this response. A significant discovery is that heterozygous deletion of the parentally imprinted gene, *Mest*, eliminates pup retrieval behavior in virgin female mice, and produces deficits in placentophagia in newly parturient mothers, with a smaller percentage of both types of mice engaging in nest-building (Lefebvre et al. 1998). *Mest* is expressed in the

brains of adult females in the hypothalamus and amygdala, a finding consistent with the known involvement of those neural regions in the control of neural behavior (Bridges 1998).

Other genes regulating maternal behavior in mammals have recently been identified: deletion of the *fosB* gene results in severe disruption of maternal behavior in mice; a deficiency of dopamine β -hydroxylase, the enzyme responsible for the synthesis of norepinephrine and epinephrine, reduces retrieval responses in female mice; and deletion of the gene that encodes the prolactin receptor (PRL-r) results in large deficits in retrieval behavior in homozygous virgin female mice and reduced levels of such behavior in heterozygous postpartum females (Bridges 1998). While we cannot directly extrapolate from mice to humans, the close evolutionary relationship between the murine and human genomes (which contain many identical genes) makes it highly likely that we will eventually identify genes of similar effect in humans, as has been done in many other areas of genetic inquiry, for example the *SRY* gene that controls the developmental switch for male sexual differentiation in both mice and humans (Koopman et al. 1991).

The fact that specific genes involved in maternal behavior are located on different chromosomes suggests that multiple genes exerting varying effects influence these complex behaviors. The origins of maternal behavior and male nurturing behaviors lie in a group of quantitative genetic traits that probably overlap to a considerable extent, and are also affected by environmental factors. Some of these genetic traits, for example height, display continuous variation, and are best conceptualized as characters that individuals display to a greater or a lesser extent; others display discontinuous variation, that is, they are dichotomous characters that one either does or does not possess.

However, unlike single-gene Mendelian traits, where the possession of the character is determined simply by the possession of a particular gene, multifactorial discontinuous traits, depending partly on environmental factors, have a more complex etiology. As Falconer (1981) showed, multiple genes contribute to a continuously variable susceptibility to such traits that may be low or high and that follows a Gaussian (or normal) distribution in the population. Falconer also postulated the existence of a threshold: thus, individuals whose total susceptibility, either from genetic factors alone or from genetic and environmental factors combined, exceeds a critical threshold will develop a trait, while those whose susceptibility is below the threshold do not.

Genes in such complex multi-gene systems are called quantitative trait loci. The concepts of continuously variable susceptibility and threshold values for the development of a trait have been helpful in understanding the etiology of such common complex traits as susceptibilities to diabetes, heart

disease, and hypertension, all multifactorial traits affected to a greater or lesser degree by environmental factors, for example diet and lifestyle. These concepts have given us some insight into how the same genes can produce different phenotypes, given different environmental inputs; thus of two individuals with an identical high underlying genetic susceptibility to heart disease, the one who consumes a high-fat diet, smokes, and fails to exercise may exceed the threshold level and develop the disease, while another who eats healthily, does not smoke, and exercises regularly may not.

Complex genetic traits are increasingly being implicated in human behavior (Plomin, Defries, and McClearn 1997; Plomin and Craig 1997). Plomin and Craig provide another perspective on complex traits, with evidence from studies into cognitive abilities/disabilities that the genetic factors involved in reading *disability* are the same genetic factors that contribute to the quantitative dimension of reading *ability*. The implication is that the genes for reading disability are also associated with the normal range of variation in reading ability; thus disorders are simply “the extremes of quantitative traits caused by the same genetic and environmental factors responsible for variation throughout the dimension” (Plomin and Craig 1997: 1122). This quantitative trait loci approach renders the sharp qualitative distinction between normal and abnormal invalid, an unwarrantedly dichotomous way of looking at ranges of variation in human behavior.

If we apply this approach to thinking about biological predispositions to nurturing behavior, it is easy to conceptualize how maternal or nurturing instincts may be both biologically based and found at very low or very high levels in a few individuals, but with the majority of any given population near to the middle of the range. If we add to this basic variability the plasticity of human behavioral development in response to differing environmental stimuli during ontogeny—the course of development of an individual organism—and widely varying environmental conditions in later life that may promote or suppress nurturing instincts, including our conscious awareness of the costs and benefits of having children, then one can understand the complexity of the causal antecedents of fertility motivation. The final section of this article provides some thoughts on the kind of model that will allow us to unravel the interplay of motivational factors in reproductive decisionmaking.

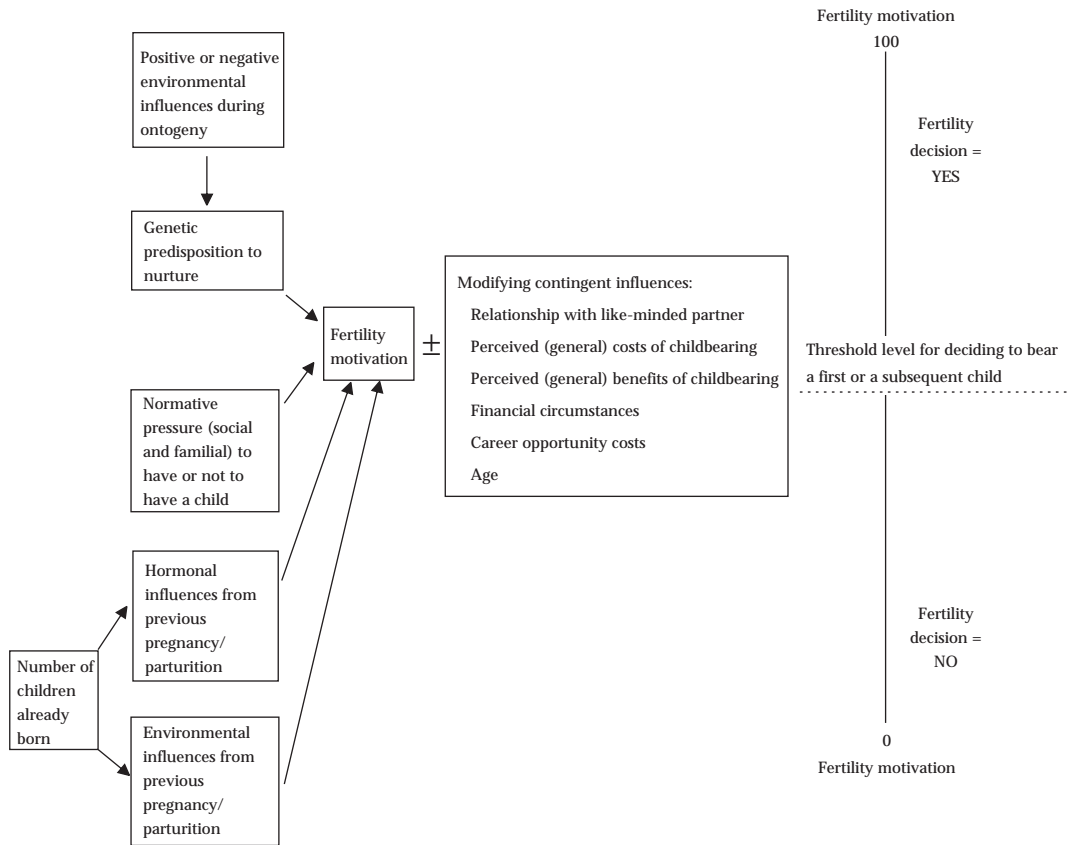
Toward a biosocial model of fertility motivation

The “quantitative trait loci” approach discussed above provides a promising new perspective for examining variation in many aspects of human behavior, including the analysis of fertility motivation. On the basis of evidence presented above, I believe that a strong but individually variable genetic predisposition for maternal or nurturing behaviors in women provides a

significant part of fertility motivation in most women stimulated by exposure to “attractive” infants and translated into conscious fertility motivation in conjunction with environmental factors such as normative pressure. If such variable biological levels of fertility motivation exist, based on coding for maternal or nurturing behaviors and developing in response to and interacting with environmental factors, then our models of reproductive decisionmaking must become considerably more flexible.

One of the issues that quantitative genetic models highlight and help to explain is “multiple conjunctural causation,” whereby the same outcome can result from several different combinations of conditions (Ragin 1987); this way of dealing with causal complexity seems appropriate to apply to fertility behavior. Interestingly, two noteworthy demographic analyses, Johansson and Mosk’s (1987) comparative study of mortality decline in Japan, Italy, and England and Wales, and Bongaarts’s (1993) assessment of the fertility impact of family planning programs, use models of multiple conjunctural causation that (although lacking the genetic element) are directly analogous to quantitative trait loci models in their successful approach to explaining complex causality.

Assuming that we can identify a variable biological element as part of fertility motivation, how might we construct an integrated model of fertility motivation, showing interaction between biological and environmental factors? That causation in fertility motivation is likely to be both multiple and conjunctural is consistent with everything we know about its constituent elements; a model must therefore try to show how the different elements might fit together, and in how many different combinations, to produce a given outcome—that is, having a child or remaining childless. Figure 1 is a schematic model of fertility motivation, with a notional numerical scale of fertility motivation calibrated as ranging from 0 to 100, with 50 as the threshold level for deciding to bear a first or a subsequent child. The notional numerical scores help us to visualize how the different components in fertility decisionmaking fit together, with potentially very different values of the many variables for different women at different times, given heterogeneous genetic and environmental influences. On the left-hand side of the figure are the key variables of the model that combine to give the basic level of fertility motivation. First is the genetic predisposition to nurture with which we are born (and that varies between individuals) and that develops into a behavioral capacity to nurture only if reinforced with appropriate environmental stimuli during ontogeny, or development. The second key variable is normative pressure, from the individual’s family and social group and from society at large, to bear or stop bearing children. In some cases the strength of this variable may overrule the individual’s biological predisposition in either direction. Thus, in a highly pronatalist and coercive society, such as Romania under Ceausescu, a woman with a low

FIGURE 1 A schematic biosocial model of fertility motivation

NOTE: See discussion in text.

genetic predisposition toward nurturing, who might otherwise have chosen to remain childless, may be denied access to contraception and induced abortion and have little option but to bear children. Conversely, a woman in present-day China with a high level of genetic fertility motivation may be forced to limit her family to one child because of the sanctions against many couples who exceed this limit.

The values of these two variables combine to give the basic level of fertility motivation, which may or may not exceed the threshold level for deciding to have a child. A third feedback influence to this basic level of fertility motivation comes from the number of children already born: previous childbearing will provide both biological (in the form of hormonal changes) and environmental influences from previous experience of preg-

nancy, parturition, and childrearing. As described above, the hormonal changes induced by pregnancy and parturition generally provide a strong impetus toward nurturing and maternal behaviors, quite independently of the basic genetic predisposition toward nurturing behavior. A particularly positive or negative experience of pregnancy, childbirth, and childrearing of the first child may also have a significant effect on a woman's motivation to bear additional children.

The basic value or score of fertility motivation we have now reached is then influenced by a number of further variables, any one of which may affect a woman's decisionmaking in a strongly positive or negative way, or may be of little or no influence. Thus, some women will not have a child, even with a strong biological predisposition so to do, unless they are in a relationship with a like-minded partner; other women will simply have a child in any event. Age can affect fertility decisionmaking in various ways: some women prefer to be young mothers, others prefer to wait until they establish their careers; but not having found the right partner may confound these preferences. Reaching the mid-30s age group is likely to be a strongly positive factor in deciding to have a child because of rapidly decreasing fecundity and the increasing risk of fetal abnormalities. A purely economic model of fertility would consider the career opportunity costs of childbearing as a negative influence on fertility motivation, but this factor may have the opposite effect for women who dislike their jobs and would be happy to leave them, or for women who regard bringing up the next generation as more important work than being "economically active."³

Using a biosocial model means that we can offer no straightforward causal explanation of fertility decisionmaking. This approach acknowledges that where causation is multiple and conjunctural, there may be no necessary or sufficient conditions for a particular outcome (in this case the decision to bear a child), and strict quantitative analysis of the relative influence of different variables may be impossible. By using this kind of integrated conceptual model, we can thus arrive at a theory of fertility motivation that deals with causal complexity and acknowledges the importance of biological influences on our behavior. This represents an advance over rational choice models, which by definition cannot incorporate the nonrational elements in human behavior.

Nurturing and fertility: The missing link

This article has advanced the hypothesis that post-transitional societies have probably reached the limits to low fertility because most women, motivated by a genetically and environmentally developed desire to nurture, will choose to have at least one child, given reasonably favorable circumstances. One may object that although the evidence for a desire to nurture has been clearly

established, no empirical evidence has been provided for the vital link between nurturing and fertility. This observation does not necessarily invalidate the hypothesis, because the available demographic data on fertility decisions are based on surveys that do not address issues relating to individual motivation for having children, let alone possible biological bases for such motivation.

Current demographic data sources, based on large-scale surveys, have provided the basis for quantitative analysis of variation in fertility over time and between populations, and of the statistical relationship between various sociocultural and economic factors and reproductive behavior. They tell us nothing at all, however, about individual fertility motivation—that is, why women decide to have children at all—or about the relative importance of different influences in women’s decisionmaking. Motivation for childbearing itself has not been explored to date in large-scale demographic surveys, since in current demographic theory there is a basic assumption that desired family size is greater than zero: the usual point of departure for research on motives for fertility behavior has not been why people have *any* children, but why some people choose to have more or fewer than others. Thus, demographic surveys typically only ask women the number of children they currently have and the number they expect to have in their lifetimes.

How can the link between biological predispositions and subsequent behavior be established? The significance of this question extends beyond the subject matter of this article: despite recent advances in the neurosciences and behavioral genetics, scientific understanding of the human brain and of the nature, extent, and mechanisms of biological influences over human behavior is still in its infancy. Any approach suggested here for establishing the hypothesized link between nurturing and fertility must be tentative. It certainly cannot be done simply by identifying a gene or genes “for” nurturing: in almost all cases the pathway between genes and behavior is far more complex than suggested by reference to a simple causal link, and is complicated by the phenomenon of consciousness. As discussed above, the expression of genes is contingent on environmental influences. Thus, while we will undoubtedly identify human genes that are *associated* with nurturing behaviors (these have already been found in other species), this will not help us to explain or predict specific fertility behavior in humans, as the genetic influence is only one of many element influencing our reproductive behavior.

Because my argument is predicated on the majority of women having a conscious awareness of a (biologically based) desire to nurture and acting on that awareness in deciding to have one or more children, empirical support for this theory must be sought by studying women’s accounts of their motives for wanting to have children. This requires small-scale, qualitative

research using focused in-depth interviews, as suggested and practiced by Knodel (1997), who has demonstrated that qualitative approaches derived from sociology can illuminate and improve upon demographic survey data (Knodel 1998; Knodel, Havanon, and Pramualratana 1984). Obermeyer (1997: 815) has pointed out that using this type of analytic approach is problematic, in that “asking individuals about their behavior and motivations [does] not always resolve the frequent dissonance between statements, perceptions, and reality.” Yet, given that we are concerned with untangling the diverse influences that lie behind individual decisions about childbearing, asking women about their motivations must be the most sensible place to start.⁴

Conclusion

Our increasing knowledge of genetic influences on human behavior highlights the complex etiology of such behavior, and this article has sought to show that incorporating insights from the biological sciences into demographic analyses of human behavior enriches, rather than simplifies, such analyses. Evolved human behaviors are contingent rather than necessary, and genetic predispositions show immense variability in their expression according to the lifetime experiences of the individual (including sometimes not being expressed at all). Thus, acknowledging the role that our biological predisposition toward nurturing behavior plays in the motivation for childbearing does not mean that all women are genetically determined to become mothers: to put it in the terms of the feminist slogan of the 1970s, biology is *not* destiny.

In the second half of the twentieth century, women in industrialized, post-transitional societies have, for the first time in history, been given the chance to bypass the necessary connection between sex and childbearing through the use of efficient contraception and induced abortion, thus severing the link between biology and destiny. What remains is the knowledge that to a greater or lesser extent we all have a need to nurture and be nurtured; this is a manifest characteristic of our evolved human psychology, as has been documented in the many empirical studies cited above. The strength of that need in most of us is evidenced by the fact that despite the high costs and great difficulties of bearing and bringing up children, and in the absence of social coercion, most women still choose to have at least one child. There is no inevitable link between genetic predispositions and behavior, and it is therefore logically possible that our predisposition toward nurturing could be suppressed, resulting in further falls in birth rates. In the absence of extreme environmental pressures against having children, however, it is overwhelmingly likely that women will continue to fulfill this fundamental human need by having children. The limits to low fertility are thus very probably in sight.

Notes

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1 Spain 1.15, Romania 1.17, Czech Republic 1.19, Italy 1.20, Bulgaria 1.23, Latvia 1.25, Slovenia 1.26, Greece 1.28, Estonia 1.28, Germany 1.30. Among other TFRs of interest are those of Japan 1.43, Poland 1.53, Sweden 1.57, France 1.71, United Kingdom 1.72, Australia 1.79, Ireland 1.90, United States 1.99, New Zealand 2.01. These estimates are for 1995–2000: see United Nations 1999.

2 I lay no claim to originality for this theory, which merely makes use of ideas and evidence that are commonplace in the biological sciences. Indeed, a professor of zoology who was kind enough to review an earlier draft of this article commented that “as a biologist it hardly comes as a surprise to me that ‘fertility motivation’ should prevent reproductive rates reaching zero!” However, this article is directed at an audience of demographers, not evolutionary biologists, and thus assumes no expert knowledge of the biological sciences. The idea that parental or nurturing behaviors may

gratify fundamental psychological needs in humans was eloquently put forward over a quarter of a century ago by Judith Bardwick (1974), long before the current fashion for evolutionary psychology began. My intentions are to update the empirical evidence for such evolved psychological needs and to consider how they may be involved in conscious fertility motivation.

3 This model, given its concern with conscious motivation for childbearing, does not incorporate stochastic factors, but we should not forget their importance in determining overall levels of fertility. Even with highly efficient contraception and abortion legally available, many births that take place clearly were not intended. Data for England in the early 1990s show that while almost half of all conceptions were “unintended or unwanted in some sense,” about 20 percent of all known pregnancies were legally terminated (Coleman 1996: 36). This figure implies a substantial proportion of births that were “in some sense” unintended.

4 I will be conducting such an investigation in the near future. Although some studies on fertility motivation do exist in the psychological literature (e.g., Mackey and White 1992 and Miller 1995, both of which contain responses that might be interpreted as in accordance with the nurturing hypothesis), the limitations of these studies are such that they will not be introduced as supporting evidence here.

References

- Adler, M. A. 1997. “Social change and declines in marriage and fertility in eastern Germany,” *Journal of Marriage and the Family* 59: 37–49.
- Bardwick, J. M. 1974. “Evolution and parenting,” *Journal of Social Issues* 30(4): 39–62.
- Becker, G. S. 1960. “An economic analysis of fertility,” in *Demographic and Economic Change in Developed Countries*. Princeton: National Bureau of Economic Research.
- . 1981. *A Treatise on the Family*. Cambridge, MA: Harvard University Press.
- Berenbaum, S. A. and E. Snyder. 1995. “Early hormonal influences on childhood sex-typed activity and playmate preferences: Implications for the development of sexual orientation,” *Developmental Psychology* 31: 31–42.
- Berman, P. W. 1980. “Are women more responsive than men to the young? A review of developmental and situational variables,” *Psychological Bulletin* 88(3): 668–695.

- . 1986. "Young children's responses to babies: Do they foreshadow differences between maternal and paternal styles?" in *Origins of Nurture: Developmental, Biological, and Cultural Perspectives on Caregiving*, ed. A. Fogel and G. F. Melson. Hillsdale, NJ: Lawrence Erlbaum Associates, pp. 25–51.
- Berman, P. W. and V. Goodman. 1984. "Age and sex differences in children's responsiveness to babies: Effects of adults' caretaking requests and instructions," *Child Development* 55: 1071–1077.
- Berman, P. W., V. Goodman, V. L. Sloan, and L. Fernander. 1978. "Preference for infants among black and white children: Sex and age differences," *Child Development* 49: 917–919.
- Berman, P. W., L. D. Monda, and R. P. Meyerscough. 1977. "Sex differences in young children's responses to an infant: An observation within a day-care setting," *Child Development* 48: 711–715.
- Berman, P. W., V. L. Smith, and V. Goodman. 1983. "Development of sex differences in response to an infant and to the caretaker role," *Journal of Genetic Psychology* 143: 283–284.
- Blakemore, J. E. O. 1981. "Age and sex differences in interaction with a human infant," *Child Development* 52: 386–388.
- . 1990. "Children's nurturant interactions with their infant siblings: An exploration of gender differences and maternal socialization," *Sex Roles* 22: 43–57.
- . 1991. "The influence of gender and temperament on children's interactions with a baby," *Sex Roles* 24: 531–537.
- Bongaarts, J. 1993. "The fertility impact of family planning programs," in *Family Planning: Meeting Challenges, Promoting Choices*, ed. P. Senanyake and R. L. Kleinman. Pearl River, NY: Parthenon, pp. 51–70.
- Bridges, R. S. 1998. "The genetics of motherhood," *Nature Genetics* 20: 108–109.
- Brunelli, S. A and M. A. Hofer. 1990. "Parental behaviour in juvenile rats: Environmental and biological determinants," in *Mammalian Parenting*, ed. N. A. Krasnegor and R. S. Bridges. Oxford: Oxford University Press, pp. 372–399.
- Coleman, D. (ed.). 1996. *Europe's Population in the 1990s*. Oxford: Oxford University Press.
- Daly, M. 1990. "Evolutionary theory and parental motives," in *Mammalian Parenting*, ed. N. A. Krasnegor and R. S. Bridges. Oxford: Oxford University Press, pp. 25–39.
- Dittmann, R. W. et al. 1990. "Congenital adrenal hyperplasia I: Gender-related behaviours and attitudes in female patients and sisters," *Psychoneuroendocrinology* 17: 153–170.
- Dunn, J. and C. Kendrick. 1979. "Interaction between young siblings in the context of family relationships," in *The Child and Its Family*, ed. M. Lewis and L. A. Rosenblum. New York: Plenum.
- Ehrhardt, A. A. and S. W. Baker. 1974. "Fetal androgens, human central nervous system differentiation, and behavior sex differences," in *Sex Differences in Behavior*, ed. R. C. Friedman, R. M. Richart, and R. L. Van de Vele. New York: Wiley, pp. 33–51.
- Eisenberg, L. 1990. "The biosocial context of parenting in human families," in *Mammalian Parenting*, ed. N. A. Krasnegor and R. S. Bridges. Oxford: Oxford University Press, pp. 9–24.
- Ermisch, J. 1996. "The economic environment for family formation," in *Europe's Population in the 1990s*, ed. D. Coleman. Oxford: Oxford University Press, pp. 144–159.
- Falconer, D. S. 1981. *Introduction to Quantitative Genetics*. 2nd ed. London: Longman.
- Feldman, S. S. and S. C. Nash. 1978. "Interest in young babies during adulthood," *Child Development* 49: 617–622.
- Feldman, S. S., S. C. Nash, and C. Cutrona. 1977. "The influence of age and sex on responsiveness to babies," *Developmental Psychology* 13: 675–676.
- Fleming, A. S. 1990. "Hormonal and experiential correlates of maternal responsiveness in human mothers," in *Mammalian Parenting*, ed. N. A. Krasnegor and R. S. Bridges. Oxford: Oxford University Press, pp. 184–207.

- Fleming, A. and G. Orpen. 1986. "Psychobiology of maternal behavior in rats, selected other species and humans," in *Origins of Nurturance: Developmental, Biological, and Cultural Perspectives on Caregiving*, ed. A. Fogel and G. F. Melson. Hillsdale, NJ: Lawrence Erlbaum Associates, pp. 141–207.
- Fleming, A. S. and J. S. Rosenblatt. 1974. "Maternal behavior in the virgin and lactating rat," *Journal of Comparative and Physiological Psychology* 86(5): 957–972.
- Fogel, A., G. F. Melson, and J. Mistry. 1986. "Conceptualizing the determinants of nurturance: A reassessment of sex differences," in *Origins of Nurturance: Developmental, Biological, and Cultural Perspectives on Caregiving*, ed. A. Fogel and G. F. Melson. Hillsdale, NJ: Lawrence Erlbaum Associates, pp. 53–67.
- Foley, R. 1995. "Evolution and adaptive significance of hominid maternal behaviour," in *Motherhood in Human and Nonhuman Primates*, ed. C. R. Pryce, R. D. Martin, and D. Skuse. Basel: Karger, pp. 27–36.
- Foster, C. 1998. "To have or have not: A study of voluntary childlessness," unpublished BA dissertation, University of Oxford.
- Frodi, A. M. and M. E. Lamb. 1978. "Sex differences in responsiveness to infants: A developmental study of psychological and behavioral responses," *Child Development* 49: 1182–1188.
- Fullard, W. and A. M. Reiling. 1976. "An investigation of Lorenz's 'babyness,'" *Child Development* 47: 1191–1193.
- Golini, A. 1998. "How low can fertility be? An empirical exploration," *Population and Development Review* 24(1): 59–73.
- Gorski, R. A. 1990. "Structural sexual dimorphisms in the brain," in *Mammalian Parenting*, ed. N. A. Krasnegor and R. S. Bridges. Oxford: Oxford University Press, pp. 61–90.
- Grafen, A. 1990. "Do animals really recognize kin?" *Animal Behaviour* 39: 42–54.
- Hamilton, W. D. 1964. "The genetical evolution of social behaviour (I and II)," *Journal of Theoretical Biology* 7: 1–16; 17–52.
- Helleday, J., G. Edman, M. Ritzen, and B. Siwers. 1993. "Personality characteristics and platelet MAO activity in women with congenital adrenal hyperplasia (CAH)," *Psychoneuroendocrinology* 18: 343–354.
- Hobcraft, J. and K. E. Kiernan. 1995. "Becoming a parent in Europe," *Welfare State Programme Discussion Paper 116*, London School of Economics, Suntory-Toyota Centre for Economics and Related Disciplines.
- Hofer, M. A. 1981. *The Roots of Human Behavior: An Introduction to the Psychobiology of Early Development*. San Francisco: W. H. Freeman.
- Johansson, S. R. and C. Mosk. 1987. "Exposure, resistance and life expectancy: Disease and death during the economic development of Japan, 1900–1960," *Population Studies* 41: 207–235.
- Keverne, E. B. 1995. "Neurochemical changes accompanying the reproductive process: Their significance for maternal care in primates and other mammals," in *Motherhood in Human and Nonhuman Primates*, ed. C. R. Pryce, R. D. Martin, and D. Skuse. Basle: Karger, pp. 69–77.
- Keyfitz, N. 1987. "The family that does not reproduce itself," *Population and Development Review* 12 (Supp): 139–154.
- Knodel, J. 1997. "A case for nonanthropological qualitative methods for demographers," *Population and Development Review* 23(4): 847–853.
- . 1998. "Using qualitative data for understanding old-age security and fertility," in *The Methods and Uses of Anthropological Demography*, ed. A. M. Basu and P. Aaby. Oxford: Oxford University Press, pp. 57–80.
- Knodel, J., N. Havanon, and A. Pramualratana. 1984. "Fertility transition in Thailand: A qualitative analysis," *Population and Development Review* 10(2): 297–328.
- Kohler, Hans-Peter, J. L. Rodgers, and K. Christensen. 1999. "Is fertility behavior in our genes? Findings from a Danish twin study," *Population and Development Review* 25(2): 253–288.

- Koopman, P. et al. 1991. "Male development of chromosomally female mice transgenic for *Sry*," *Nature* 351: 117–121.
- Krasnegor, N. A. and R. S. Bridges. 1990. "Future directions in research on mammalian parenting," in *Mammalian Parenting*, ed. N. A. Krasnegor and R. S. Bridges. Oxford: Oxford University Press, pp. 485–488.
- Krebs, J. R. and N. B. Davies. 1993. *An Introduction to Behavioural Ecology*. 3rd ed. Oxford: Blackwell Scientific Publications.
- Lampman, C. and S. Dowling-Guyler. 1995. "Attitudes toward voluntary and involuntary childlessness," *Basic and Applied Social Psychology* 17(1/2): 213–222.
- Lefebvre, L. et al. 1998. "Abnormal maternal behaviour and growth retardation associated with loss of the imprinted gene *Mest*," *Nature Genetics* 20: 163–169.
- Leibenstein, H. M. 1957. *Economic Backwardness and Economic Growth: Studies in the Theory of Economic Development*. New York: Wiley.
- Lesthaeghe, R. 1995. "The second demographic transition in Western countries: An interpretation," in *Gender and Family Change in Industrialized Countries*, ed. K. O. Mason and A-M. Jensen. Oxford: Clarendon Press, pp. 17–62.
- Leveroni, C. L. and S. A. Berenbaum. 1998. "Early androgen effects on interest in infants: Evidence from children with congenital adrenal hyperplasia," *Developmental Neuropsychology* 14 (2/3): 321–340.
- Lorenz, K. 1943. "Die angeborenen Formen möglicher Erfahrung," *Zeitschrift für Tierpsychologie* 5(2): 235–409.
- . 1971. *Studies in Animal and Human Behaviour*, Vol. 2. London: Methuen.
- Maccoby, E. E. and C. N. Jacklin. 1974. *The Psychology of Sex Differences*. Palo Alto, CA: Stanford University Press.
- Mackey, W. C. and V. White. 1992. "Reasons American men become fathers: Men's divulgences, women's perceptions," *Journal of Genetic Psychology* 153(4): 435–445.
- McKenna, J. J. 1981. "Primate infant caregiving behavior: Origins, consequences and variability with emphasis on the common Indian Langur monkey," in *Parental Care in Mammals*, ed. D. J. Gubernick and P. H. Klopfer. New York: Plenum Press, pp. 389–415.
- Melson, G. F. and A. Fogel. 1982. "Young children's interest in unfamiliar infants," *Child Development* 53: 693–700.
- Melson, G. F., A. Fogel, and J. Mistry. 1986. "The study of nurturant interactions: From the infant's perspective," in *Origins of Nurturance: Developmental, Biological, and Cultural Perspectives on Caregiving*, ed. A. Fogel and G. F. Melson. Hillsdale, NJ: Lawrence Erlbaum Associates, pp. 69–90.
- Miller, W. B. 1995. "Childbearing motivation and its measurement," *Journal of Biosocial Science* 27: 473–483.
- Mitchell, G. D. 1968. "Attachment differences in male and female monkeys," *Child Development* 39(2): 611–620.
- Moltz, H. 1971. "The ontogeny of maternal behavior in some selected mammalian species," in *The Ontogeny of Vertebrate Behavior*, ed. H. Moltz. New York: Academic Press, pp. 263–313.
- Morgan, S. P. and R. B. King. 1998. "Why have children? Biological predisposition, rational choice, and social coercion," paper prepared for Lowest Low Fertility Workshop, Max Planck Institute for Demographic Research, Rostock, Germany, December.
- Namboodiri, K. and L. Wei. 1998. "Fertility theories and their implications regarding how low fertility can be," *Genus* LIV(1–2): 37–55.
- Nash, S. C. and S. S. Feldman. 1981. "Sex-related differences in the relationship between sibling status and responsiveness to babies," *Sex Roles* 7: 1035–1042.
- New, M. I. (ed.). 1985. "Congenital adrenal hyperplasia," *Annals of the New York Academy of Sciences* 458.
- Obermeyer, C. M. 1997. "Qualitative methods: A key to a better understanding of demographic behavior?" *Population and Development Review* 23(4): 813–818.

- Plomin, R. 1993. "Nature and nurture: Perspective and prospective," in *Nature, Nurture, and Psychology*, ed. R. Plomin and G. E. McClearn. Washington, DC: American Psychological Association, pp. 459–485.
- Plomin, R. and I. Craig. 1997. "Human behavioural genetics of cognitive abilities and disabilities," *Bioessays* 19(12): 1117–1124.
- Plomin, R., J. C. Defries, and G. E. McClearn. 1997. "Nature, nurture and behavior," in *Behavioral Genetics*. 3rd ed. New York: W. H. Freeman, pp. 57–87.
- Plomin, R. and G. E. McClearn (eds.). 1993. *Nature, Nurture, and Psychology*. Washington, DC: American Psychological Association.
- Potts, M. 1997. "Sex and the birth rate: Human biology, demographic change, and access to fertility-regulation methods," *Population and Development Review* 23(1): 1–39.
- Quadagno, D. M., R. Briscoe, and J. S. Quadagno. 1977. "Effect of perinatal gonadal hormones on selected nonsexual behavior patterns: A critical assessment of the nonhuman and human literature," *Psychological Bulletin* 84: 62–80.
- Radke-Yarrow, M., C. Zahn-Waxler, and M. Chapman. 1983. "Children's prosocial dispositions and behavior," in *Handbook of Child Psychology, Vol 4: Socialization, Personality and Social Development*, ed. P. H. Mussen. New York: Wiley, pp. 469–545.
- Ragin, C. C. 1987. *The Comparative Method: Moving Beyond Qualitative and Quantitative Strategies*. Berkeley: University of California Press.
- Resnick, S. M. 1982. "Psychological functioning in individuals with congenital adrenal hyperplasia: Early hormonal influences on cognition and personality," unpublished doctoral dissertation, University of Minnesota, Minneapolis.
- Rich, A. C. 1977. *Of Woman Born: Motherhood As Experience and Institution*. London: Virago.
- Rosenblatt, J. S. and H. I. Siegel. 1981. "Maternal behavior in nonprimate mammals," in *Parental Care in Mammals*, ed. D. J. Gubernick and P. H. Klopfer. New York: Plenum Press, pp. 13–76.
- Rovi, Susan L. D. 1994. "Taking 'NO' for an answer: Using negative reproductive intentions to study the childless/childfree," *Population Research and Policy Review* 13: 343–365.
- Swartz, K. B. and L. A. Rosenblum. 1981. "The social context of parental behavior," in *Parental Care in Mammals*, ed. D. J. Gubernick and P. H. Klopfer. New York: Plenum Press, pp. 417–454.
- Tooby, J. and L. Cosmides. 1992. "The psychological foundations of culture," in *The Adapted Mind: Evolutionary Psychology and the Generation of Culture*, ed. J. H. Barkow, L. Cosmides, and J. Tooby. Oxford: Oxford University Press.
- Udry, J. R. 1996. "Biosocial models of low-fertility societies," *Population and Development Review* 22 (Supp): 325–336.
- United Nations. 1999. *World Population Prospects: The 1998 Revision*. Volume I: *Comprehensive Tables*.
- van de Kaa, D. J. 1987. "Europe's second demographic transition," *Population Bulletin* 42(1).
- Willis, R. J. 1973. "A new approach to the economic theory of fertility behaviour," *Journal of Political Economy* 81(2, part 2): 514–564.
- Wilson, C. C. and D. C. Turner (eds.). 1998. *Companion Animals in Human Health*. Thousand Oaks, CA: Sage Publications.
- Zahn-Waxler, C. and M. Radke-Yarrow. 1982. "The development of altruism: Alternative research strategies," in *The Development of Prosocial Behaviour*, ed. N. Eisenberg-Berg. New York: Academic Press, pp. 109–137.

Relative Cohort Size: Source of a Unifying Theory of Global Fertility Transition?

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AS EMPHASIZED BY John Caldwell (1997), demographers still do not possess a “unifying theory” of the global fertility transition. They tend to “treat the earlier transitions, unassisted by national family planning programs, as qualitatively different” from those occurring in the last half-century. They have not even been able to develop a unified theory covering fertility transitions in currently developing countries (Caldwell and Caldwell 1997). Notestein’s (1945) framework, commonly known as the “demographic transition,” does not explain the wide variation in timing of the fertility transition, relative to the mortality transition, and in rates of decline.¹ The maxim “economic development is the best contraceptive,” favored by economists, has come increasingly under attack.

In this article I point out an empirical regularity in the global data that appears to have gone unnoticed, but that synthesizes two hypotheses first advanced by Richard Easterlin (1966, 1978a). The first is that relative cohort size affects male relative wages, which in turn affect fertility: what I refer to as his theory of relative cohort size. The second is the “supply-demand” framework for explaining fertility in developing countries that combines the economic concept of demand for children with the sociological concept of supply.

As I demonstrated in a recent review and evaluation (Macunovich 1998a), while the theory of relative cohort size has been the focus of more than 75 studies using developed-country data, it has never been applied in a developing-country context. Conversely, the supply-demand framework has been adopted widely as a descriptive tool in studying the fertility transitions of the past half-century, but is not generally associated with fertility patterns in the developed countries. And while the relative cohort size theory provides a quantitative mechanism for explaining the fluctuations in demand for children that lead to fertility booms and busts, the supply-de-

mand framework, like the theory of the demographic transition, does not explain why the demand for surviving births declines when it does. Many factors have been identified as correlated with the decline, including reductions in infant mortality, the increasing net cost of children with economic development, the gradual replacement of children as a source of old-age support, and the increased acceptance of individual control over fertility; but these seem to be necessary rather than sufficient conditions for fertility reduction. None of them has a good track record in identifying the initiation of fertility decline.

The data that I present here suggest that the relative cohort size mechanism applies not just in developed countries but also within the supply-demand framework, providing the heretofore missing explanation. The present analysis is simple in light of the breadth and depth of the literature on the fertility transition. But in some ways that simplicity is its best feature, for in its lack of specificity it consolidates a framework that appears to describe the genesis of fertility transitions around the globe, as well as fluctuations in fertility after the demographic transition has been completed.

Easterlin's relative cohort size theory

Easterlin (1987b) defined his hypothesis in *The New Palgrave* as follows: "The Easterlin, or 'cohort size', hypothesis posits that, other things constant, the economic and social fortunes of a cohort (those born in a given year) tend to vary inversely with its relative size, approximated by the crude birth rate in the period surrounding the cohort's birth. The linkage between higher birth rates and adverse economic and social effects arises from what might be termed 'crowding mechanisms' operating within three major social institutions—the family, school and labour market." He went on to describe the labor market mechanism involved: imperfect substitutability between younger and older workers, leading to a deterioration in the wages of the young relative to those of the older generation. Since "a comparison between younger and older adults...translates largely into a comparison of children with their parents," and "if parents' living levels play an important role in setting their children's material aspirations,...then an increase in the shortfall of children's wage rates relative to parents, will cause the children to feel relatively deprived and under greater pressure to keep up."

Easterlin hypothesized that this deterioration in a cohort's prospects relative to those of its parents may induce demographic adjustments by members of the younger generation, including delayed marriage, reduced fertility, and increased female labor force participation as they seek to maintain their relative economic status. In this formulation it is relative, rather than absolute, income that is a factor in decisionmaking, and relative cohort size is seen as the primary determinant of secular shifts in relative income.

Easterlin (1978a) introduced relative income concepts into his discussion of the fertility transition as follows:

Because of the substantial upward trend in living levels during economic development, each generation typically comes from a more prosperous background than that of the preceding generation. Because of this, the views of each successive generation as to the material requisites of the “good life” tend to be progressively higher. Goods which to one generation may have been luxuries become necessities to the next—the automobile is a case in point. This “inter-generation taste effect,” as it might be called, tends to raise the minimum living level which parents feel is necessary before they can “afford” to have children.... [T]here is a floor to the curvilinear indifference map at the minimum required living level. Below this floor the indifference lines become horizontal, signifying that welfare depends only on the parents’ goods and having children adds nothing to satisfaction. With the progress of economic growth this “subsistence” floor shifts upward and the marginal rate of substitution decreases at any given point above the floor, indicating that children are becoming less attractive relative to goods. In effect, a third (“subsistence level”) constraint is added to the analysis...along with the budget line and production constraints. (p. 115)

But the potential connection between relative cohort size and relative income—and hence fertility—has been applied only in the post-transition context (Macunovich 1998a). It has not been used to explain the fertility transition itself.

The supply–demand framework

Although economists have long discussed the demand for children, Easterlin (1978a) is generally credited with the formal juxtaposition of the economic concept of demand with the sociological concept of supply in a framework that incorporated both the demand for children and the demand for, and costs of, fertility regulation. Perhaps his most well-known formulation of this framework is presented in his work with Eileen Crimmins (1985), where it was used to explain secular shifts in fertility during the demographic transition.

Their stylized framework divided the demographic transition into roughly five phases. The initial pretransition phase is characterized by an excess demand for surviving births because of high mortality rates and involuntary infecundity. Declining infant mortality and, possibly, rising fecundability resulting from improved health and nutrition during the mortality transition transform this excess demand into a potential excess supply in the second phase; in the third phase the salience of this excess supply is magnified by a decline in the demand for children. The potential for an

excess supply of children motivates fertility-control behavior. Thus despite a continued fall in demand, any realized excess supply is gradually eliminated in a fourth phase, with the length of that phase determined by the costs of fertility regulation, psychic as well as economic. The stylized transition ends with a rough equilibrium between demand and achieved supply, despite a potentially very large excess supply.

Within this supply–demand framework the reduced mortality among children and young adults that in time increases relative cohort size would add to the potential excess supply of surviving births in the second phase of this framework, and thus generate additional motivation for fertility control. But since this is only a conceptual framework, it provides no explanation for the declining demand for children that occurs in the third and fourth phases. In addition to changing norms and attitudes toward children (which still need to be explained), researchers have suggested changes in the costs and benefits of children, and changing relative prices, as factors in this decline. But the relationship between changing relative cohort size and changing relative income has not been examined in this context.

Tests of the relative cohort size hypothesis

Tests of the relative cohort size (RCS) hypothesis fall into two categories: the effects of RCS on male relative income; and the effects of changes in RCS and/or male relative income on fertility. The first of these categories was addressed in terms of the relative wages of US baby boomers in the period prior to 1980 by, among others, Freeman (1979), Welch (1979), and Berger (1984), all of whom demonstrated strong effects of the type suggested by Easterlin. Korenman and Neumark (1997) extended those analyses to demonstrate similar effects in a sample of 15 industrialized countries in the period 1970–94; and I (Macunovich 1999) demonstrated that the effects of RCS were still highly significant in the United States in the 1980s and 1990s. I demonstrated, in addition, that the effects are not “symmetrical”; that is, cohorts on the “leading edge” of a boom benefit from positive aggregate demand effects that counteract the adverse effects of large cohort size, while cohorts on the “trailing edge” fail to benefit significantly as cohort size begins to decline, because of economic slowdowns brought on by that decline. The turnaround in the growth rate of new young households as RCS declines confounds producer expectations, resulting in a general production cutback whose longer-term economic impact depends on the stability of financial institutions. Thus an increase in RCS typically produces a reduction in male relative income that is not ameliorated even once relative cohort size begins to decline.

The second category of tests, carrying the effects of RCS through to fertility, has been reviewed in detail elsewhere (Macunovich 1998a). As mentioned above, the number of such tests exceeds 75; and “with an equal

number of micro- and macro-level analyses using North American data (twenty-two), the 'track record' of the hypothesis is the same in both venues, with fifteen providing significant support in each case. The literature suggests unequivocal support for the relativity of the income concept in fertility, but is less clear regarding the source(s) of differences in material aspirations, and suggests that the observed relationship between fertility and cohort size has varied across countries and time periods due to the effects of additional factors not included in most models" (p. 53). In particular, the relationship between relative income and fertility appears to be more robust than that between relative cohort size and fertility, probably because of the aforementioned asymmetric effects of RCS on relative income. In addition, Pampel (1993) demonstrates that differences in "institutional structures of collective social protection and changes in rates of female labor force participation" (p. 496) must be taken into account in analyses using cross-country data. These institutional differences tend to influence the relationship between RCS and relative income, thus weakening the observed relationship between RCS and fertility. As a result, tests of the theory using relative cohort size and the total fertility rate in countries other than the United States, Canada, Australia, and New Zealand have provided more ambiguous results.

Relative cohort size effects in developing and developed countries

It is quite possible that the motivations underlying any effect of relative cohort size on fertility in developing countries result not from an imbalance between younger and older cohorts in a formal labor market, but rather from an imbalance at the level of the family or village. Increasing RCS would require that intergenerational transfers—of agricultural holdings, for example—be divided among ever-larger numbers of offspring, resulting in a secular decline in young people's "relative income." Even in cases where a formal labor market has been established, institutional and cultural differences among countries undoubtedly temper the relationship between relative cohort size and relative income. Strong labor unions, for example, which maintain high wages for current members at the expense of new labor market entrants (probably as a protective measure during periods of large relative cohort size) would tend to counteract positive effects of subsequent smaller relative cohort size.

Similarly, developed countries with policies encouraging wage cuts rather than layoffs during periods of excess labor supply might dilute relative cohort size effects, if wage cuts occur at all levels of work experience. Studies have found, for example, that while the United States tends to have "sticky wages" that promote high unemployment during such periods, many European countries trade that unemployment for lower wages. An economy like Japan's must also experience more diluted effects of relative cohort size

on relative income. There, rigid pay scales are often tipped strongly in favor of older, more experienced workers in order to entice employees into long-term commitment. Young workers in this situation would rarely experience the benefits of smaller cohort size.

The rigidity of a country's boundaries with respect to immigration, and its policies toward "guest workers"—relevant, for example, in the case of Germany, Austria, and Oman—would also impinge on the relationship between relative cohort size and wages. Where workers can cross international boundaries freely, tests for any relationship would be most appropriate at a regional rather than a national level. Conversely, very large countries such as China or the former Soviet Union may contain many subnational "markets" in which any relative cohort size effects would emerge most clearly, especially if the movements of their citizens are restricted by government.

And at the other end of the causal network, cultural and institutional differences impinge on the relationship between relative income and such factors as marriage and childbearing. These cultural effects may show up only as differences in the overall levels of marriage and fertility, however, rather than in the response to changing economic circumstances.

Proposing a synthesis of the relative cohort size and supply–demand models

My initial focus using the two models is on a pretransition society experiencing both high fertility and high mortality, where it is possible for the demand for children to exceed the biological supply. In addition, as noted by Bourgeois-Pichat (1967b):

Fertility in preindustrialized societies...is determined by a network of sociological and biological factors.... Freedom of choice by couples is almost absent. The couples have the number of children that biology and society decide to give them.

One of the main features of the so-called demographic revolution has been precisely to change not only the level of fertility but also change its nature. Having a child has been becoming more and more the result of free decision of the couple. And this change in the nature of fertility may be more important than the change in its magnitude. (p. 163)

That is, in pretransition society either conscious fertility control is absent or control is exercised only through cultural constraints within the community, not at the level of the individual couple.

Initially, a decline in infant mortality is observed: the first stage of the mortality transition. This may accompany economic development or occur prior to that change, as a result of international public health interventions. Because

“[h]igh levels of child mortality still found in low income countries are primarily due to gastroenteritis and diarrheal disease” (Schultz 1981: 116), typically mortality rates fall first among infants, who are most susceptible to these diseases. Within the context of the supply–demand model, this reduction results in an increase in the biological supply of surviving infants, but will not necessarily be translated into a significant increase in the supply of young adults until mortality rates decline among young children and teenagers as well.

The reduction in infant mortality, followed by child and teen rates, will result 15 to 20 years later in an increase in relative cohort size—the size of cohorts just entering the labor market (and family formation) relative to the number of prime-age adults—and a decline in relative wages. The mechanism might be similar to that documented in the United States and other industrialized countries. An excess supply of young relative to prime-age adults depresses the relative wages of the young workers to the extent that they are poor substitutes for older, more experienced ones. Alternatively, in less sophisticated economies the relative decline in earning potential for younger workers may take the form of reduced size of landholdings passed on from parents to a larger number of surviving offspring. However it occurs, this need only be a relative decline. That is, concurrent economic development might raise absolute wages at all age levels; but if the wages of younger workers progress more slowly than those of older workers, as they will for large cohorts, younger workers will still tend to experience relative deprivation.

The effects of this labor market crowding may be exacerbated by crowding in the family, given increasing child survival rates, and in schools to the extent that they are available. The earning potential of young men will be reduced relative to their material aspirations as shaped in their parental households. They will feel less able to support themselves at a standard commensurate with that experienced in their parents’ homes. The resultant decline in relative income would lead young couples to seek to delay or forgo marriage and/or reduce fertility in an attempt to maintain a higher level of per capita disposable income.

In this way, a society with little or no individual control of fertility will begin to experience a strong motivation for such control. Large cohorts are known for their disruptive effects on social norms (as, for example, in the United States in the 1960s and 1970s, and in Iran today). In this case, a large cohort’s need for fertility control may mark a turning point in a society’s attitudes toward contraception and toward the individual’s—as opposed to society’s—right to control fertility. Easterlin (1978a) suggested this when he wrote:

It is possible that the emergence of a pressure for fertility limitation is one of the first forms in which modernization comes to impinge directly on the mass of the population. The appearance of a problem that had not previously ex-

isted—that of limiting family size—and thereby of a need for decision making of an entirely new sort, creates a pressure for attitudinal changes in a fundamental and immensely personal area of human experience. From this viewpoint the “population problem” may have positive consequences, by contributing to modernized attitudes that may more generally favor economic and social development. (pp. 122–123)

Easterlin cited Bourgeois-Pichat (1967a, b), Wrigley (1969), and Srinivasan et al. (1972) in describing the shift from “social sanctions” to “family sanctions” in determining fertility—the development of deliberate individual control that is fundamental to modernization. Cognitive dissonance would lead to the widespread acceptance of the concept of fertility regulation, and the passing of that milestone could have a cumulative “snowball” or “cascade” effect, as declining average family size reinforces a society’s acceptance of smaller numbers of children. This would explain the often-observed co-movement of fertility rates among older and younger women, and it is a mechanism suggested by Kenneth Wachter (1991) in explaining cyclic fertility movements in the United States.

In this way an increase in relative cohort size could initiate the fertility transition. But 15 to 20 years later, any fertility reduction will result in declining RCS: will this not tend to raise fertility rates again? The evidence from industrialized countries suggests that it will not. As mentioned earlier, relative cohort size effects on relative income are not symmetrical, because of differential aggregate demand effects on the leading and lagging edges of a baby boom. Thus one should not expect them to be symmetrical in terms of fertility.² Without some external stimulus, male relative income will not begin to increase again when RCS begins to subside, but only after a considerable lag. Any potentially positive effect of decreasing relative cohort size on young men’s wages will be counteracted for a time by the depressing effect of the economic slowdown induced by a turnaround in cohort size. This may have been the case in the industrialized countries in the 1930s and 1980s, and may also have been the recent experience of the “Asian Tigers.” In addition, any potentially positive effects of declining cohort size will be counteracted by the negative “cascade” effect of changing cultural norms on fertility rates, as set out above.

A look at the data

The United Nations (1999a, b) provides estimates of vital statistics and population age structure for 184 countries covering the period 1950 through 1995. These data are not ideal, since their preparation of necessity involved considerable interpolation, especially at greater levels of disaggregation. Far outweighing the disadvantages of the UN data is the fact that they provide a

unique source in terms of uniformity of geographical and chronological coverage. The population data were obtained in two stages: first from United Nations (1999a) for quinquennial observations and a limited number of age groupings (under 5 years, 5–14, 15–24, and 60+); and later from United Nations (1999b) in annual observations for five-year age groups by sex, although these are largely estimates and interpolations of the first set of data.

The vital statistics in the UN data, which are available only quinquennially, include aggregate rather than age-specific fertility measures, the best of which is the total fertility rate (TFR); and although they include a measure of infant mortality, no other age-specific mortality measures are available. There is no information on income.

Ideally an examination of relative cohort size effects on fertility would have access to measures of male relative income, given the asymmetry of RCS effects and the potential for intervening institutional influences on wage structure; additionally, selected variables might be used to control for changing economic costs and benefits of children and for availability of contraceptives. In the absence of such income data, the analysis should be based on specific age groupings (those aged 15–24 relative to those aged 45–54, for example) in order to capture the effects of imperfect substitutability across groups by level of labor force experience. The inclusion of younger and older members of the 25–59 age group in the denominator of RCS will dilute measured effects if—as occurs in many developed economies—those age groups are fairly good substitutes for workers aged 15–24. However, the appropriate measure of RCS may vary across countries depending on the sophistication of their labor markets. For this reason—and because the UN's five-year age groups rely on a great deal of estimation—most of the analyses presented here make use of a general measure of RCS: males aged 15–24 relative to males aged 25–59. Alternative estimates using a more specific RCS measure (males aged 15–24 relative to males aged 45–54) are presented for comparative purposes.

The fertility measure analyzed here is the TFR, as a function of the infant mortality rate (as, for example, in Schultz 1981) and as a function of RCS (approximated using the ratio of 15–24-year-olds first to those aged 25–59 and then to those aged 45–54). Although the TFR is an aggregate measure composed of fertility rates at all ages, it tends to be highly correlated with the pattern of fertility among women aged 20–29, since fecundability is highest in this age group; there is also a considerable precedent for using the TFR in tests of Easterlin's hypothesis.³ As a check on the validity of results based on the TFR, the statistical analyses presented in the next section include estimates based on a small subsample of countries and years for which age-specific fertility rates are available. These will demonstrate that the relative cohort size hypothesis appears to be supported both at the aggregate (TFR) and age-specific levels.

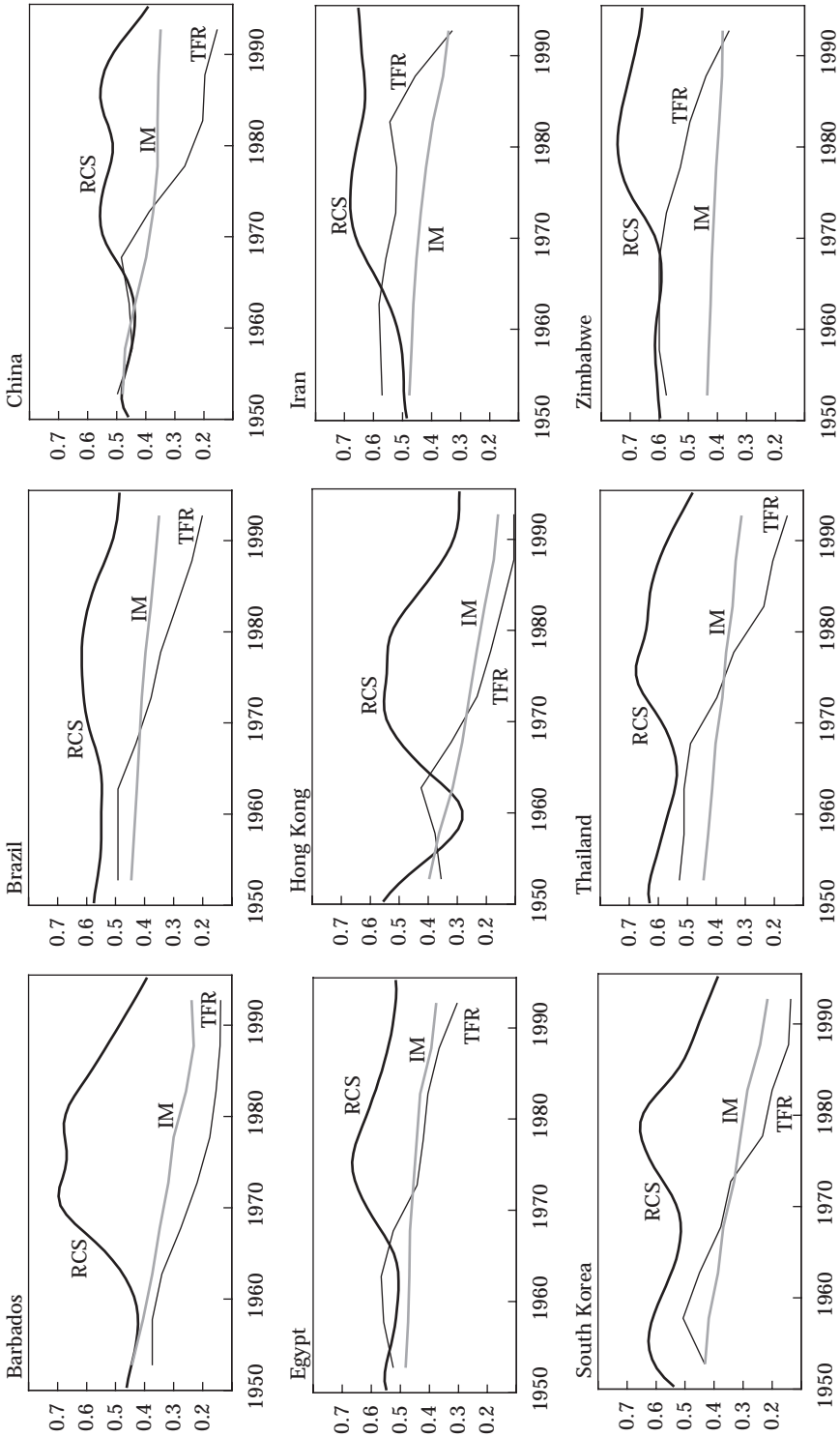
The UN data suggest that relative cohort size, probably acting through effects on male relative income, has played a crucial role in bringing about the fertility transition in developing countries between 1950 and 1995. Countries appear not to begin reducing their fertility, despite a reduction in infant mortality, until that reduction and the accompanying fall in mortality rates among children and young adults permit the proportion of the population aged 15–24 to rise relative to those aged 25–59. This is seen in more than 100 countries that have begun the fertility transition since 1950. Several that have not, such as Gambia, Guinea-Bissau, and the Congo (formerly Zaire), have not yet experienced an increase in the ratio of 15–24-year-olds to those aged 25–59, despite marked and prolonged reductions in infant mortality in many cases.

The pronounced relationship between relative cohort size and the total fertility rate is evident both in the aggregate and in country-specific data, even using data reported at five-year intervals. Figure 1 presents graphs for selected developing countries in which a characteristic relationship begins to emerge. Total fertility rates are constant or even increasing until relative cohort size begins to increase: at that point, the TFR begins to decline. Although the overall rate of TFR decline might be affected by the trend in infant mortality, its point of initiation seems in all cases to depend on the trend in relative cohort size.

This relationship has been demonstrated around the globe, in countries both small and large, regardless of religious or political orientation. Figure 2 shows that it emerges even at the regional level, in all developing parts of the world. The characteristic shape evident in these graphs is not a statistical artifact: the relative cohort size variable used here is calculated relative only to prime-age adults, not to the total population; thus RCS is not increasing as a result of the decline in the proportion of children in the population. A measure of infant mortality rates is also presented in Figures 1 and 2, and, although it is not immediately obvious because of the scaling, the levels vary widely from country to country, both at the point of initiation of fertility decline and throughout its full extent.⁴ For the nine countries shown in Figure 1, Table 1 gives infant mortality rates in 1950–55, 1990–95, and at the start of the fertility transition. Table 1 indicates that the transition in Hong Kong did not begin until infant mortality was down to 33 deaths per thousand live births, while in Egypt it began at the very high level of 175. And although Brazil and Iran exhibit similar infant mortality rates in 1990–95 (47 and 43, respectively), the TFR in Iran (5.3) is more than twice that in Brazil (2.4).

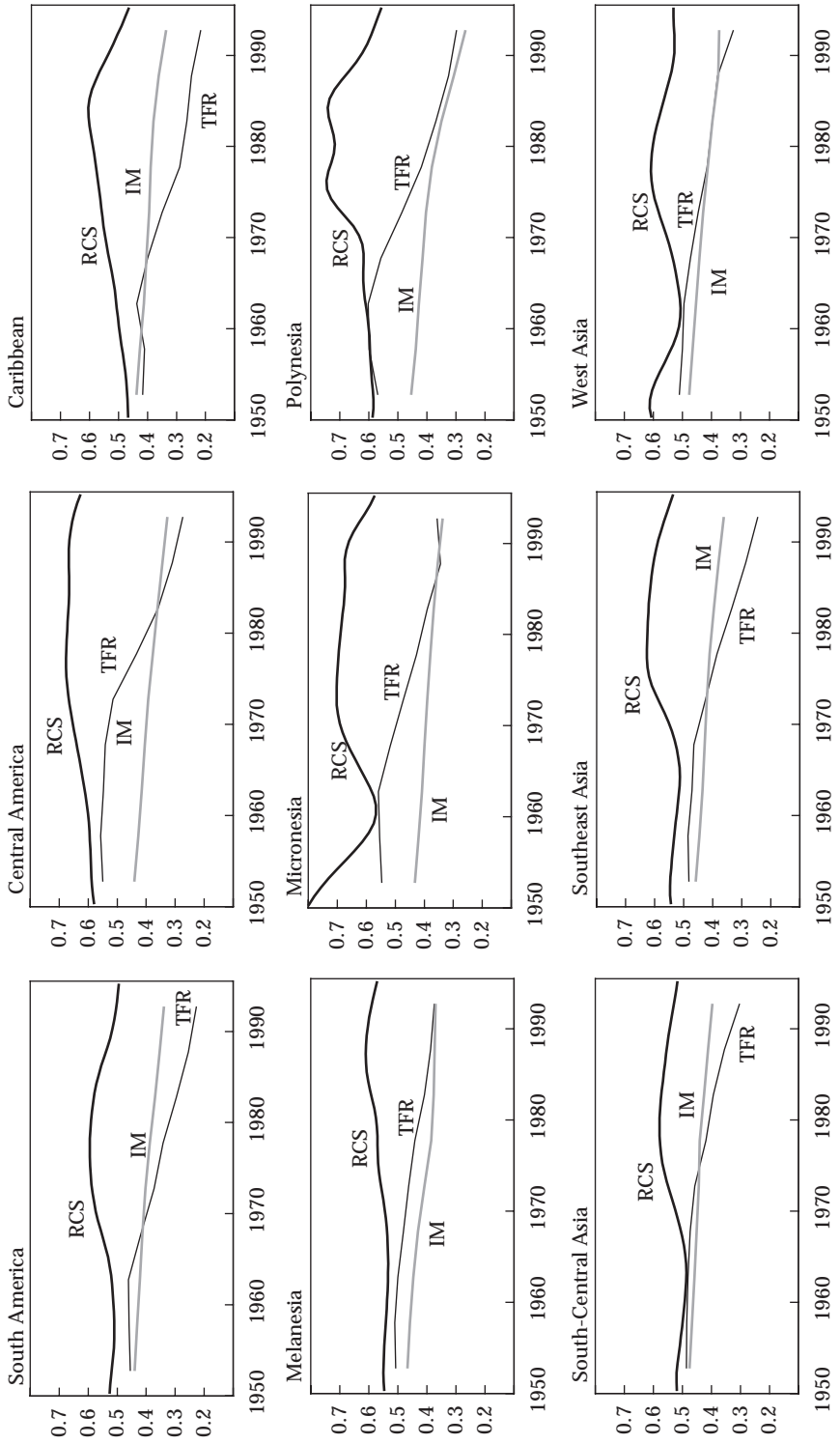
Other aspects of the diversity among the nine countries in Figure 1 are notable. Population size (in 1995) ranged from 260,000 in Barbados to 1.2 billion in China. Hong Kong is a city-state and Barbados an island. Iran is a predominately Muslim country, while Brazil has a large proportion of

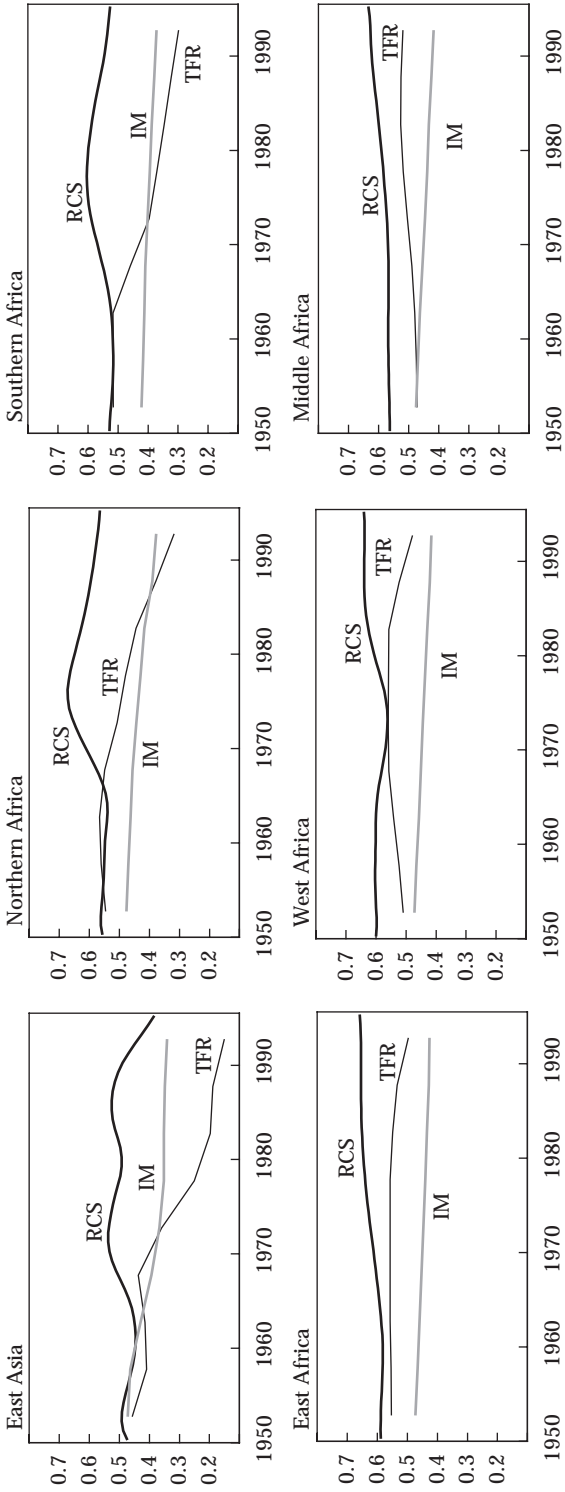
FIGURE 1 Relationship between the total fertility rate (TFR), relative cohort size (RCS), and infant mortality (IM) in selected developing countries, 1950–95



NOTES: RCS is the ratio of males aged 15–24 to males aged 25–59; TFR has been scaled by dividing by 12.5; infant mortality (in deaths per 1000 live births) has been scaled by dividing its logarithmic value by 11.
SOURCE: United Nations (1999b).

FIGURE 2 Relationship between the total fertility rate (TFR), relative cohort size (RCS), and infant mortality (IM) in developing regions of the world, 1950–95





NOTES: RCS is the ratio of males aged 15-24 to males aged 25-59; TFR has been scaled by dividing by 12.5; infant mortality (in deaths per 1000 live births) has been scaled by dividing its logarithmic value by 11.
 SOURCE: United Nations (1999b).

TABLE 1 Infant mortality rate (infant deaths per 1000 live births) in countries shown in Figure 1

Country	Infant mortality rate			At the start of the fertility transition
	1950–55	1990–95		
Barbados	132	9	87	(1960)
Brazil	135	47	109	(1965)
China	195	44	81	(1970)
Egypt	200	67	175	(1965)
Hong Kong	79	6	33	(1965)
Iran	190	43	78	(1985)
South Korea	115	11	100	(1970)
Thailand	132	32	84	(1970)
Zimbabwe	120	70	101	(1970)

SOURCE: United Nations (1999b).

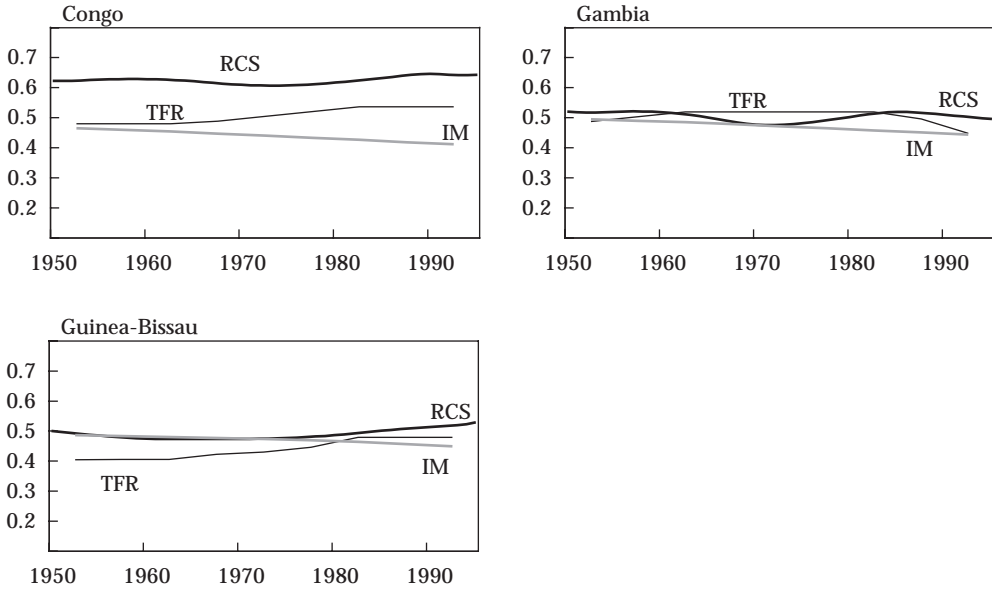
Roman Catholics. And China is not a free-market economy. The widespread imposition of a one-child policy in China has been credited by many for the country's remarkable fertility decline. However, several studies (e.g., Lavelly and Freedman 1990) have indicated that the decline began—at least in urban areas—prior to that policy, and the data presented here suggest that the underlying motivation for China's urban fertility decline was the increase in relative cohort size.

Similar graphs have been prepared for the more than 130 countries that had not experienced a fertility transition prior to 1950.⁵ Most have by now begun the transition and conform to the pattern discussed above, but there are differences among countries that undoubtedly result from cultural and/or institutional peculiarities not captured in these data. A few countries have experienced little if any fertility decline, as illustrated in Figure 3, but even among these, many like Gambia appear to be on the threshold.

In most cases the patterns of change in the two measures of relative cohort size—the ratios of 15–24-year-olds to 25–59-year-olds and to 45–54-year-olds—were found to be very similar, so that only the first measure is presented here. But for several countries this is not the case. As demonstrated in Figure 4, there is fairly close correspondence between changes in the TFR and the refined RCS measure (15–24 relative to 45–54), which is not so readily apparent between the TFR and the general measure of RCS.

In addition, several countries—such as Fiji and Nigeria—appeared not to conform to the general pattern based on earlier published data such as United Nations (1998), but fit the pattern quite well in the 1998 revisions (United Nations 1999b) available on diskette. Thus it seems possible that apparently “nonconforming” countries may eventually prove to conform,

FIGURE 3 Relationship between the total fertility rate (TFR), relative cohort size (RCS), and infant mortality (IM) in three countries that, by 1995, had shown little sign of beginning the fertility transition



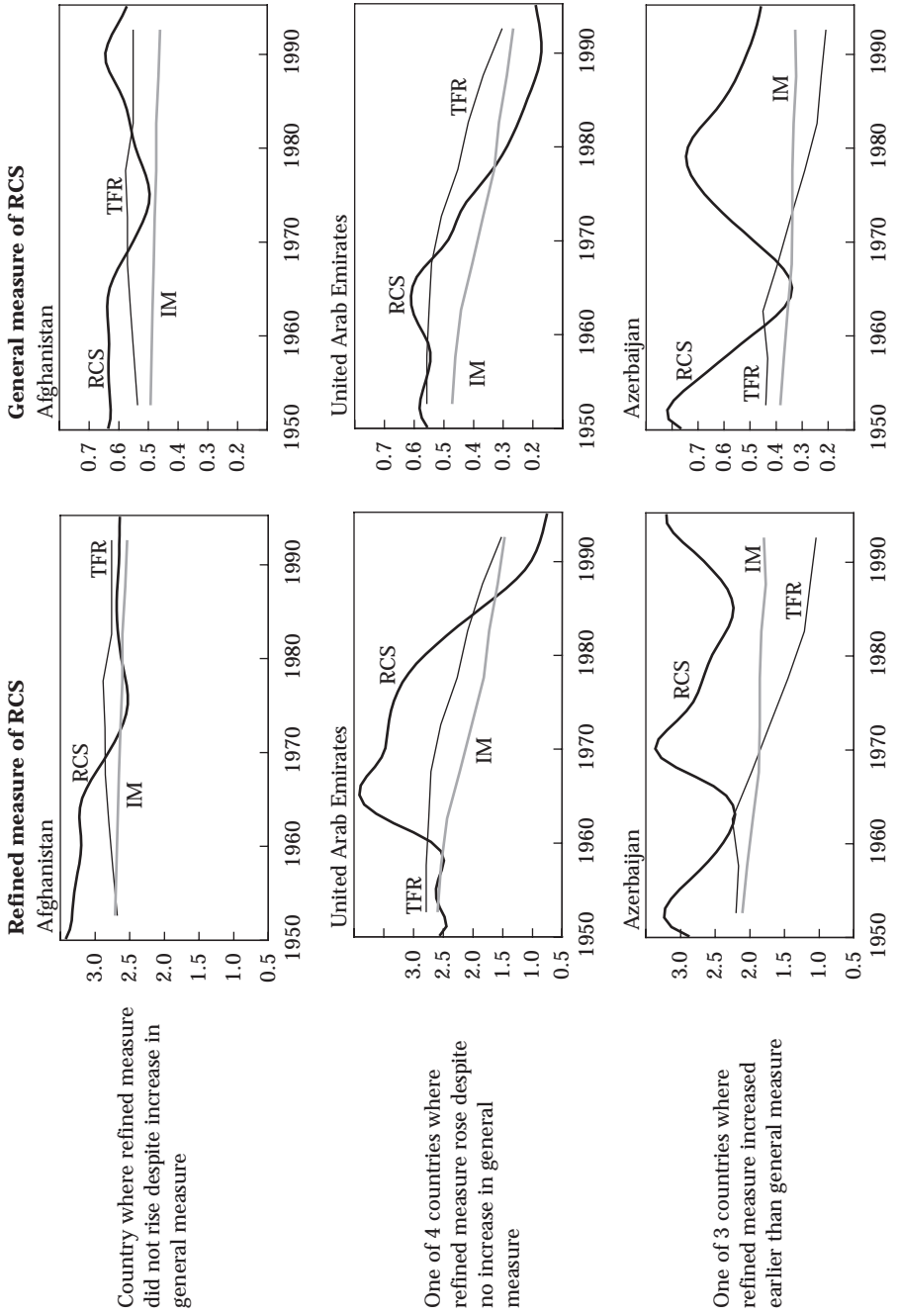
NOTES: RCS is the ratio of males aged 15–24 to males aged 25–59; TFR has been scaled by dividing by 12.5; infant mortality (in deaths per 1000 live births) has been scaled by dividing its logarithmic value by 11. SOURCE: United Nations (1999b).

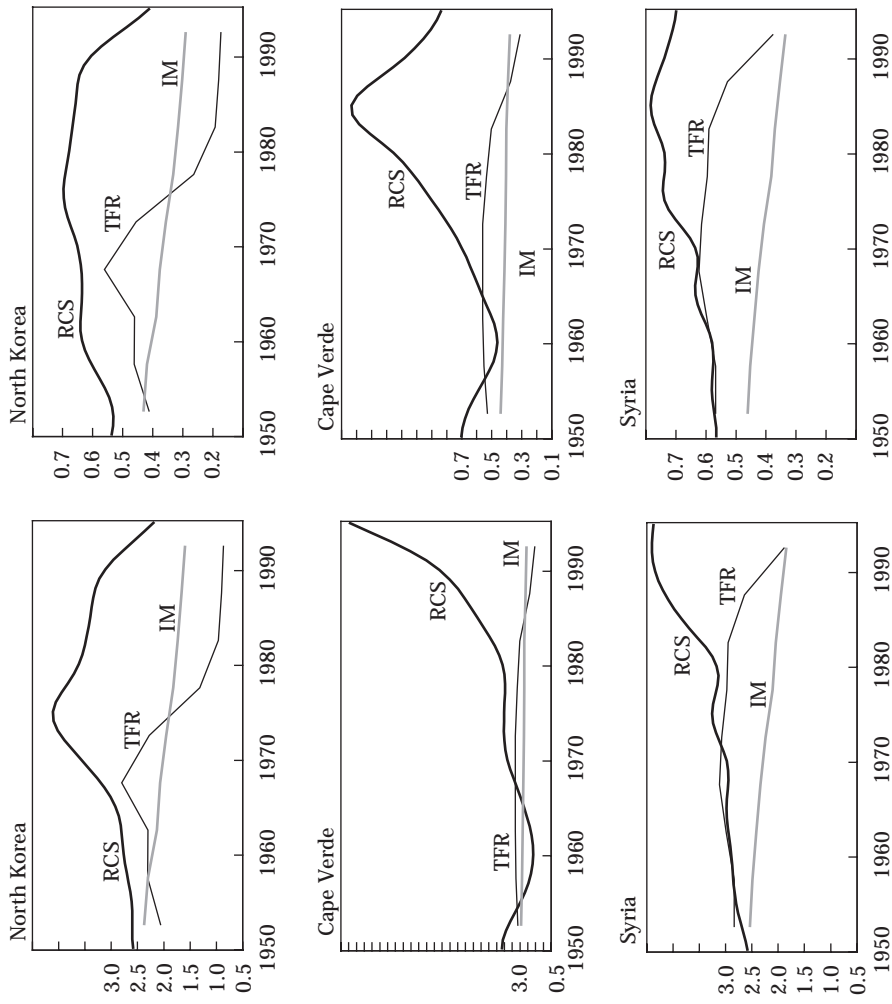
given future updating and refinement of the data; or that such nonconforming patterns are simply instances in which relative cohort size is too crudely measured, or is not directly reflected in relative income for cultural, institutional, or economic reasons. It is unfortunate that data are not available to measure relative income directly in all of these countries, since the hypothesized relationship is, after all, between relative income and the TFR, rather than directly between RCS and the TFR.

Experience during the fertility transitions of developed countries

Keyfitz and Flieger (1968) provide historical data for three industrialized countries around the time of their fertility transitions: England and Wales, France, and Sweden. Although they do not provide the TFR, they provide information on sex and age composition, together with the crude birth rate (CBR: births per 1000 population). These data are presented in Figure 5. Although not as conclusive as the patterns exhibited in most developing countries, these graphs demonstrate a similar tendency for the fertility transition to begin when relative cohort size starts to increase. Only decennial

FIGURE 4 Examples of the 14 countries that display substantive differences between the patterns of the general measure (ratio of males 15–24 to males 45–54) of relative cohort size (RCS) and refined measure (ratio of males 25–59) and refined measure (ratio of males 45–54) of relative cohort size (RCS)

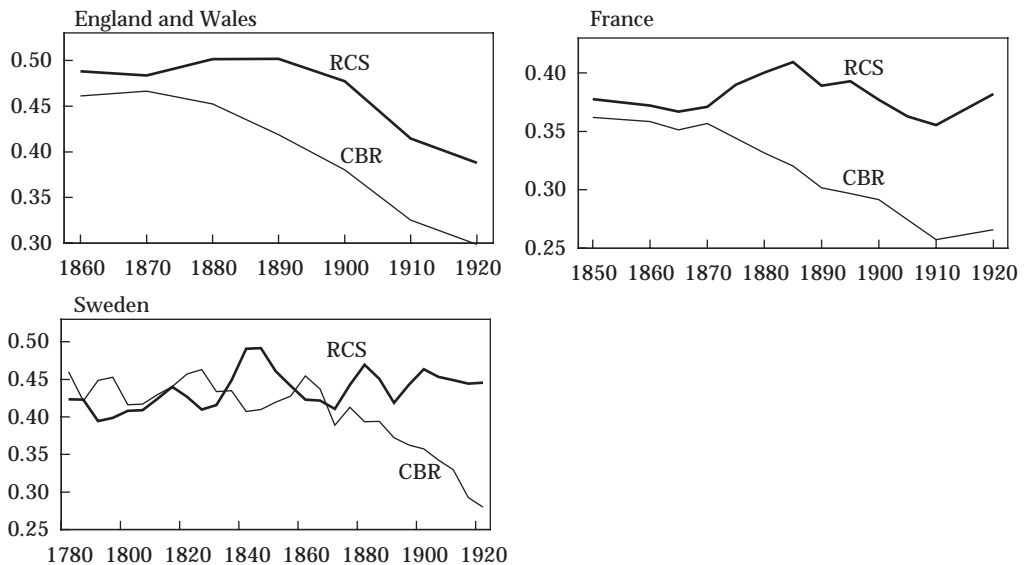




3 of 6 countries where refined measure increased later than general measure

NOTES: In each case the refined measure of RCS, presented on the left, corresponds more closely to the pattern of the TFR than does the general measure. The 14 countries that display substantive differences are: Afghanistan (where the refined measure did not rise despite an increase in the general measure); United Arab Emirates, Saudi Arabia, Kuwait, and Qatar (where the refined measure rose despite no increase in the general measure); Azerbaijan, Albania, and Armenia (where the refined measure increased earlier than the general measure); and North Korea, Cape Verde, Syria, Central African Republic, Madagascar, and Uganda (where the refined measure increased later than the general measure). The refined measure of RCS is the ratio of males aged 15–24 to males aged 25–59. TFR has been scaled by dividing by 12.5; infant mortality (in deaths per 1000 live births) has been scaled by dividing its logarithmic value by 11.

FIGURE 5 Relationship between relative cohort size (RCS) and the crude birth rate (CBR) during the fertility transition in England and Wales, France, and Sweden



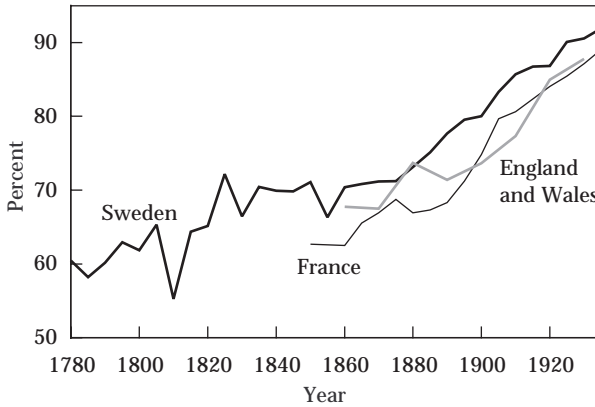
NOTES: RCS is the ratio of males aged 15–24 to males aged 25–59; CBR (in births per 1000 population) has been scaled by dividing by 75.

SOURCE: Keyfitz and Flieger (1968).

observations are available for England and Wales, so it is possible that some of the increase there is missed, but a decided increase in RCS occurred in France. Sweden experienced a sharp jump in RCS after 1825 that seemed to initiate a decline in fertility; but this was followed by an equally sharp drop in RCS, with some recovery in fertility, so that the real fertility transition only occurred after 1870 when RCS increased once again.

Figure 6 suggests that improved survival rates among children and young adults were the primary reason relative cohort size began to increase when it did in each of these three countries. The percent surviving to age 15 began to increase in 1870 in England and Wales—at the same point that RCS began to increase—whereas both RCS and the survival probability began to increase slightly earlier in France, in about 1865. A much longer history is available for Sweden, where there appears to be an explanation for the “on again, off again” changes in RCS and fertility between 1825 and 1870. The survival probabilities of children and young adults in Sweden increased markedly prior to 1825, producing an increase in RCS up to about 1840, but then faltered and did not resume their improvement until after 1870, coincident with an increase in RCS and the beginning of Sweden’s fertility transition.

FIGURE 6 Probability (in percent) of surviving to age 15 in England and Wales, France, and Sweden, 1780–1940



SOURCE: Keyfitz and Flieger (1968).

Statistical tests

A simple visual inspection of the relationship between relative cohort size and fertility is an inadequate test of the hypothesized relationship between them, however. Regression analysis can be used to determine whether the apparent relationship is statistically significant. The model to be tested here is simplistic, containing only RCS and infant mortality as explanatory variables. To control for the many other factors that are thought to play a role in fertility determination, a lag of TFR itself is included, which contains information about these other factors (and will control to some extent for changing norms and attitudes). That is, in this quinquennial data the value of the TFR in time $t-5$ is used as another explanatory variable in estimating the equation for the TFR in time t .

Relative cohort size is represented in the model using two variables: one to control for the *level* of RCS as suggested by Easterlin, and the other to control for its *rate of change*, in order to allow for asymmetry in the effects of RCS on fertility; this approach is similar to the one adopted for relative income in Macunovich (1998b, 1999, 2000). The hypothesis is that a positive rate of change in RCS will slow the decline in fertility when cohort size is rising, while a negative rate of change will dampen fertility increases when cohort size is declining. It is assumed that any economic slowdown results not so much from declining relative cohort size as from the transition to decline and its effect on expectations and business investment. Thus in theory it is important to be able to identify that point of transition; but this is difficult because while annual population estimates are provided in the UN data,

only quinquennial observations of TFR and infant mortality are available. The RCS rate-of-change variable is thus calculated as the value in year t minus the value in year $t-5$, since it would be inappropriate to associate quinquennial changes in the TFR with anything other than quinquennial changes in RCS.

A complication is introduced by the fact that levels of RCS will be lower in societies where the level of fertility has been low, or where the level of infant mortality has been high, creating a potential for spurious correlation among levels because of a relationship flowing from past values of fertility and infant mortality to RCS. The focus in this analysis is on any contemporaneous effects of changes in RCS on changes in the TFR; thus it is appropriate here to examine only changes in TFR, RCS, and infant mortality. These changes, or first differences, in the value of each variable are calculated by subtracting the value of each variable in time $t-5$ from its value in time t . Although a change in the TFR or infant mortality in time t will affect changes in RCS 15 to 20 years later, there can be no possibility of an immediate effect once the correlation in levels has been removed. In the case of infant mortality, fertility is expected to respond to the cumulative effect of changes in infant mortality, rather than to changes in only the most recent period. Thus the variable used to control for the effects of infant mortality in year t is the sum of the changes observed between 1950 and year t .⁶

Table 2 provides estimated effects of relative cohort size—both level and rate of change—and infant mortality on the total fertility rate when all 184 countries in the UN data are included. Even though the lagged TFR exerts a very strong effect, RCS and its rate of change exhibit highly significant estimated coefficients. Although the impact of infant mortality is significant, the standardized coefficients presented in italics indicate that the absolute effect of RCS is substantially greater (-0.21 for RCS but only 0.17 for cumulative changes in infant mortality). Even with these additional controls, the estimated coefficient on RCS remains highly significant, with the hypothesized negative sign. And despite the potential weakness of the measure of RCS change used in the analysis, that variable is estimated to have a fairly strong and significant effect, with the expected positive sign.

In all of these models, the positive impact of the lagged TFR supports the idea of a “cascade” effect on social norms regarding fertility during the transition, with the declining fertility rate in past years exerting a strong influence on subsequent fertility. This cascade effect together with the asymmetry of the relative cohort size effect accounts for the continuing decline of the TFR in developing countries, even once RCS has begun to decline. Additional analyses not presented here demonstrate that similar results are obtained when the model is estimated separately for subsets of the UN data: four groups of countries based on their fertility levels in 1950–55, and eight groups of countries by geographic region.⁷ In all cases RCS exhibits the ex-

TABLE 2 Regression coefficients, with and without allowing for asymmetry, of the effects of changes in relative cohort size and infant mortality on changes in the total fertility rate in 184 countries between 1950 and 1995, using ordinary least squares regression with no controls for individual country differences

	Without allowance for asymmetry	With a control for asymmetry
Relative cohort size	-0.987 <i>-0.155</i> <i>(6.3)</i>	-1.307 <i>-0.205</i> <i>(6.7)</i>
Change in RCS		0.449 <i>0.083</i> <i>(2.7)</i>
Infant mortality	0.002 <i>0.168</i> <i>(6.7)</i>	0.002 <i>0.173</i> <i>(6.9)</i>
Lagged TFR	0.458 <i>0.450</i> <i>(18.0)</i>	0.448 <i>0.440</i> <i>(17.5)</i>
Number of observations	1,288	1,288
Adjusted R-square	0.259	0.263

NOTES: The dependent variable is the first difference of the total fertility rate (TFR). Relative cohort size (RCS) is the ratio of males aged 15–24 to males aged 25–59. All independent variables are expressed as first differences, and infant mortality is the cumulative change from 1950 to year *t*. *t*-statistics are italicized in parentheses, and standardized coefficient estimates are in italics.
SOURCE: Author’s calculations based on data in United Nations (1999b).

pected negative effect on TFR, and this effect is always statistically significant when the RCS change variable is included in the model. The estimated relative cohort size effects are particularly strong and significant for the industrialized countries as a group, with a large and significant negative effect of RCS, as hypothesized by Easterlin, and a significant positive effect of the RCS change variable, consistent with findings in models of male relative income (Macunovich 1999).

Finally, as a check on the relevance of the TFR in the analysis of relative cohort size effects, Table 3 presents results obtained from estimating the model using only younger women’s fertility rates. The data used here cover only a small subset of the 1,288 observations in the full data set, based on availability. Only quinquennial observations were used in the analysis of age-specific rates, to ensure comparability with the original TFR-based results (and because infant mortality was available only quinquennially). Table 3 demonstrates that the hypothesis is supported when analysis is limited to the age-specific fertility rates of a small sample of younger women.

TABLE 3 Estimation, allowing for asymmetry, of the effects of changes in relative cohort size and infant mortality on changes in younger women's age-specific fertility rates in selected developing and developed countries

	Developing countries		Full sample
	15-19	15-19, 20-24, and 25-29	15-19, 20-24, and 25-29
Relative cohort size	-115.036 <i>-0.467</i> <i>(2.1)</i>	-165.737 <i>-0.332</i> <i>(2.6)</i>	-78.948 <i>-0.174</i> <i>(2.8)</i>
Change in RCS	103.965 <i>0.479</i> <i>(2.2)</i>	146.198 <i>0.333</i> <i>(2.6)</i>	61.488 <i>0.153</i> <i>(2.4)</i>
Lagged fertility (age specific)	0.161 <i>0.193</i> <i>(0.9)</i>	0.112 <i>0.130</i> <i>(1.1)</i>	0.099 <i>0.106</i> <i>(2.0)</i>
Infant mortality (cumulative decrease)	0.049 <i>0.199</i> <i>(0.9)</i>	0.153 <i>0.307</i> <i>(2.7)</i>	0.118 <i>0.205</i> <i>(3.8)</i>
Intercept	-0.550 <i>(0.2)</i>	-1.829 <i>(0.5)</i>	-3.367 <i>(2.1)</i>
Number of observations	27	81	336
F-statistic	1.91	4.22	7.60
prob>F	0.1446	0.0039	0.0000
Adjusted R-square	0.1227	0.1387	0.0731

NOTES: The dependent variable is the first difference of age-specific fertility rates. Relative cohort size (RCS) is the ratio of males aged 15-24 to males aged 25-59. *t*-statistics are italicized in parentheses, and standardized coefficient estimates are in italics.

SOURCES: Age-specific fertility data taken from Coleman (1999) and U.S. Census Bureau (1999).

Larger relative cohort size is estimated to reduce fertility (the coefficient on RCS is significant and negative), but this reduction is asymmetric: weaker when cohort size is declining than when it is on the increase (the coefficient on RCS change is significantly positive). This result holds for the developing countries alone, as well as for the sample as a whole.

Conclusions

The attempt here has been to demonstrate that changes in relative cohort size are influential in determining the pattern of fertility—not just historically in developed countries, but also in countries as they pass through the demographic transition. The increase in relative cohort size that occurs as a result of declining mortality rates during the demographic transition in part

determines when the fertility portion of the transition begins. The increasing proportion of young adults generates a downward pressure on young men's relative wages; this in turn causes young adults to accept a tradeoff between family size and material wellbeing. This acceptance of a tradeoff could mark a turning point in a society's regulation of fertility, setting in motion a "cascade" or "snowball" effect in which total fertility rates tumble as social norms regarding individual control of fertility and acceptable family sizes begin to change.

This aspect of the demographic transition has been overlooked because of a focus on absolute rather than relative income, a focus that is apparent in the following statement from Caldwell and Caldwell (1997: 20–21):

The search for materialist thresholds is frustrating. If we compare Britain in 1871 with a range of countries in Asia and Africa a century later when their fertility was beginning to fall or soon would fall, some surprising findings emerge.... In terms of real per capita income,...Britain was at the start of its fertility decline, ten times as wealthy as Bangladesh, and almost twice as rich as Thailand. The proportion of its workforce working outside agriculture was four times that in Bangladesh or Kenya and more than double Sri Lanka's proportion. Its proportion of population living in conurbations with more than half a million inhabitants was eighteen times the proportion in Sri Lanka and even six times that in Thailand.

The evidence presented here suggests that one thing these countries had in common at the point of transition was increasing relative cohort size. Countries appear not to begin reducing their fertility, despite a reduction in infant mortality, until that reduction and the accompanying fall in mortality rates among children and young adults permit the proportion of those aged 15–24 to rise relative to those aged 25 and older. According to Easterlin's (1980, 1987a) hypothesis this would create downward pressure on the relative wages of young adults, leading them to reduce fertility in order to achieve their desired level of material aspirations. This phenomenon is observed in country after country that has begun the fertility transition since 1950—more than 100 in all—and evidence suggests that this was the case in earlier transitions as well.

These results are consistent with the hypothesis advanced by Watkins (1990), who suggested that "market integration" was one reason for a pronounced reduction in demographic diversity in European provinces in the nineteenth century. Labor market integration would have generated common trends across provinces in terms of relative incomes. Similarly, Coale and Watkins (1986) found that fertility patterns in various cities of Europe generally resembled patterns in the cities' own hinterlands (i.e., market areas) more than they did patterns in other cities.

Thus relative cohort size can be thought of as the mechanism that forestalls excessive rates of population change: reducing fertility when previously high rates, in combination with low mortality rates, have caused relative cohort size to increase, and increasing fertility when previously low rates have caused relative cohort size to decrease. The mechanism appears to have been operating not just in currently developed post-transition economies, but during both recent and historic fertility transitions, to the extent that social and economic institutions have permitted relative cohort size to have a bearing on the relative income of younger males.

Notes

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1 Simon Szreter (1993) writes that “[d]emographic transition theory is generally considered to have been given its classic formulation in two separate publications, by Frank W. Notestein and by Kingsley Davis, both composed in 1944 and published in 1945” (p. 661). In that year Davis (1945) edited an entire volume devoted to demographic transition theory. In addition, Szreter points out that Warren S. Thompson, “America’s then-leading demographer,” had already “publicly presented” the concept in 1929 but “[a]t that time it seems to have suffered a stillbirth” (*ibid.*).

2 Two factors are important here. First, as demonstrated in Macunovich (1998c), increases in relative cohort size produce sharp increases in the growth rate of personal consumption expenditures, which tend to strengthen economic growth and create expectations of further growth. When the growth of relative cohort size slows or reverses, the expectations are not realized and the resultant cutbacks in investment expenditures and production can cause dislocations in the economy. Thus there is a tendency for economic conditions to be strong when cohort size is on the increase, and weak when it stops increasing. Second, as demonstrated in Macun-

ovich (1998b, 1999, 2000), the wages of young, inexperienced workers tend to be boosted disproportionately in good times and depressed disproportionately in a weak economy. The combination of these factors leads to asymmetry in the effects of relative cohort size on relative wages.

3 In addition to the work of Easterlin himself, see Abeysinghe 1991, 1993; Baird 1987; Carlson 1992; Chesnais 1983; Ermisch 1979, 1980, 1983; Lee 1976; O’Connell 1978; Ohbuchi 1982; Pampel 1993; Rutten and Higgs 1984; Shields and Tracy 1986; Wachter 1975; Wright 1989; Wright and Maxim 1987.

4 In order to display it along with TFR and RCS, infant mortality (in deaths per 1000 live births) has been scaled in all graphical presentations by logging it and dividing by 11.

5 These additional graphs for all the developing countries are available on request from the author, or online at <http://www.columbia.edu/~dm555/pdr/appendix.pdf>

6 The use of a cumulative measure was suggested by a referee. Results are also available from the author of tests conducted using only the most recent change in infant mortality. The variable is marginally more significant in its cumulative form.

7 These more-detailed results are available on request from the author, and also in Appendix Tables A2–A4 in the working paper online cited in note 5.

References

- Abeysinghe, T. 1991. "On testing Easterlin's hypothesis using relative cohort size as a proxy for relative income," *Journal of Population Economics* 4: 53–69.
- . 1993. "Time cost, relative income and fertility in Canada," *Journal of Population Economics* 6: 189–198.
- Artzrouni, M. A. and R. A. Easterlin. 1982. "Birth history, age structure, and post World War II fertility in ten developed countries: An exploratory empirical analysis," *Genus* XXXVIII(3–4): 81–99.
- Baird, A. J. 1987. "A note on the Easterlin model of fertility in northwestern Europe and the United States: 1950–1981," *International Journal of Comparative Sociology* XXVIII(1–2): 57–68.
- Berger, M. 1984. "Cohort size and the earnings growth of young workers," *Industrial and Labor Relations Review* 37: 582–591.
- Bourgeois-Pichat, J. 1967a. "Relation between foetal-infant mortality and fertility," *Proceedings of the World Population Conference, 1965*, Vol. 2, pp. 68–72. New York: United Nations (as cited in Easterlin and Crimmins 1985).
- . 1967b. "Social and biological determinants of human fertility in nonindustrial societies," *Proceedings of the American Philosophical Society* 3(3): 160–163 (as quoted in Easterlin and Crimmins 1985: 5).
- Caldwell, J. C. 1997. "The global fertility transition: The need for a unifying theory," *Population and Development Review* 23(4): 803–812.
- Caldwell, J. C. and P. Caldwell. 1997. "What do we now know about fertility transition?" in G. W. Jones, R. M. Douglas, J. C. Caldwell, and R. M. D'Souza (eds.), *The Continuing Demographic Transition*, pp. 15–25. Oxford: Clarendon Press.
- Carlson, E. 1992. "Inverted Easterlin fertility cycles and Kornai's 'soft' budget constraint," *Population and Development Review* 18(4): 669–688.
- Chesnais, J.-C. 1983. "La notion de cycle en démographie: la fécondité post-transitionnelle est-elle cyclique?" *Population* 38: 361–390.
- Coale, A. J. and S. C. Watkins (eds.). 1986. *The Decline of Fertility in Europe*. Princeton: Princeton University Press.
- Coleman, D. 1999. Zip files of total and age-specific fertility rates made available as part of the Oxford Population Project at <http://marx.apsoc.ox.ac.uk/oxpop/>
- Davis, K. 1945. "The world demographic transition," *Annals of the American Academy of Political and Social Science* 237: 1–11.
- Easterlin, R. A. 1966. "On the relation of economic factors to recent and projected fertility changes," *Demography* 3(1): 131–153.
- . 1978a. "The economics and sociology of fertility: A synthesis," in C. Tilly (ed.), *Historical Studies of Changing Fertility*, pp. 57–133. Princeton: Princeton University Press.
- . 1978b. "What will 1984 be like? Socioeconomic implications of recent twists in age structure," *Demography* 15(4): 397–432.
- . 1980. *Birth and Fortune: The Impact of Numbers on Personal Welfare*. New York: Basic Books.
- . 1987a. *Birth and Fortune: The Impact of Numbers on Personal Welfare*. Second Edition. New York: Basic Books (includes an Epilogue not found in 1980 edition).
- . 1987b. "Easterlin hypothesis," in J. Eatwell, M. Milgate, and P. Newman (eds.), *The New Palgrave: A Dictionary of Economics*, Volume 2, pp. 1–4. New York: Stockton Press.
- Easterlin, R. A. and G. A. Condran. 1976. "A note on the recent fertility swing in Australia, Canada, England and Wales, and the United States," in H. Richards (ed.), *Population, Factor Movements and Economic Development: Studies Presented to Brinley Thomas*, pp. 140–151. Cardiff: University of Wales Press.
- Easterlin, R. A. and E. M. Crimmins. 1985. *The Fertility Revolution: A Supply–Demand Analysis*. Chicago: University of Chicago Press.

- Ermisch, J. F. 1979. "The relevance of the 'Easterlin hypothesis' and the 'new home economics' to fertility movements in Great Britain," *Population Studies* 33: 39–58.
- . 1980. "Time costs, aspirations and the effect of economic growth on German fertility," *Oxford Bulletin of Economics and Statistics* 43: 125–143.
- . 1983. *The Political Economy of Demographic Change: Causes and Implications of Population Trends in Great Britain*. London: Heinemann.
- Freeman, R. B. 1979. "The effect of demographic factors on age-earnings profiles," *Journal of Human Resources* 14: 289–314.
- Keyfitz, N. and W. Flieger. 1968. *World Population: An Analysis of Vital Data*. Chicago: University of Chicago Press.
- Korenman, S. and D. Neumark. 1997. "Cohort crowding and youth labor markets: A cross-national analysis," National Bureau of Economic Research, Working Paper no. 6031. Cambridge, MA.
- Lavelly, W. and R. Freedman. 1990. "The origins of the Chinese fertility decline," *Demography* 27(3): 357–367.
- Lee, R. D. 1976. "Demographic forecasting and the Easterlin hypothesis," *Population and Development Review* 2: 459–468.
- Macunovich, D. J. 1998a. "Fertility and the Easterlin hypothesis: An assessment of the literature," *Journal of Population Economics* 11: 53–111.
- . 1998b. "Relative cohort size and inequality in the United States," *American Economic Review (Papers and Proceedings)* 88(2): 259–264.
- . 1998c. "The baby boom as it ages: How has it affected patterns of consumption and saving in the U.S.?" Working Paper, Maxwell Center for Policy Research, Syracuse University, Syracuse, NY.
- . 1999. "The fortunes of one's birth: Relative cohort size and the youth labor market in the United States," *Journal of Population Economics* 12: 215–272.
- . 2000. "Why the baby bust cohorts haven't boomed yet: A re-examination of cohort effects on wage inequality in the U.S.," in F. Ray Marshall (ed.), *Back to Shared Prosperity: The Growing Inequality of Wealth and Income in America*. Armonk, NY: M.E. Sharpe.
- Notestein, F. W. 1945. "Population—The long view," in T. W. Schultz (ed.), *Food for the World*, pp. 36–57. Chicago: University of Chicago Press.
- O'Connell, M. 1978. "The effect of changing age distributions on fertility: An international comparison," in J. L. Simon (ed.), *Research in Population Economics*, Vol. 1, pp. 233–245. Greenwich, CT: JAI.
- Ohbuchi, H. 1982. "Empirical tests of the Chicago model and the Easterlin hypothesis: A case study of Japan," *Journal of Population Studies (Jinkogaku Kenkyu)* 5 (May): 8–16.
- Pampel, F. C. 1993. "Relative cohort size and fertility: The socio-political context of the Easterlin effect," *American Sociological Review* 58: 496–514.
- Rutten, A. and R. Higgs. 1984. "Graphic tests of Easterlin's hypothesis: Science or art?" in J. L. Simon (ed.), *Research in Population Economics*, Vol. 5, pp. 201–212. Greenwich, CT: JAI.
- Schultz, T. P. 1981. *Economics of Population*. Reading, MA: Addison-Wesley.
- Shields, M. P. and R. L. Tracy. 1986. "Four themes in fertility research," *Southern Economic Journal* 53: 201–216.
- Srinivasan, K. et al. 1972. *Family Planning Targets by States for India*. Bombay: International Institute for Population Studies (as cited in Easterlin and Crimmins 1985).
- Szreter, S. 1993. "The idea of demographic transition and the study of fertility change: A critical intellectual history," *Population and Development Review* 19(4): 659–701.
- United Nations. 1998. *World Population Prospects: The 1996 Revision*. New York.
- . 1999a. *World Population Prospects: The 1998 Revision*, Volume I: Comprehensive Tables, New York.
- . 1999b. *World Population 1950–2050 (The 1998 Revision)*, data released on diskette by United Nations, New York.

- U.S. Census Bureau. 1999. International Data Base (IDB), available at www.census.gov/ipc/www/idbprint.html
- Wachter, K. W. 1991. "Elusive cycles: Are there dynamically possible Lee-Easterlin models for U.S. births?" *Population Studies* 45: 109-135.
- Wachter, M. L. 1975. "A time series fertility equation: The potential for a baby boom in the 1980s," *International Economic Review* 16: 609-624.
- Watkins, S. C. 1990. "From local to national communities: The transformation of demographic regimes in Western Europe, 1870-1960," *Population and Development Review* 16(2): 241-272.
- Welch, F. 1979. "Effects of cohort size on earnings: The baby boom babies' financial bust," *Journal of Political Economy* 87(5, pt. 2): S65-S97.
- Wright, R. E. 1989. "The Easterlin hypothesis and European fertility rates," *Population and Development Review* 15(1): 107-122.
- Wright, R. E. and P. S. Maxim. 1987. "Canadian fertility trends: A further test of the Easterlin hypothesis," *Review of Canadian Sociology and Anthropology* 24(3): 339-357.
- Wrigley, E. A. 1969. *Population and History*. New York: McGraw-Hill.

Co-residential Patterns in Historical China: A Simulation Study

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ANSWERING THE QUESTION how many people could have lived in large multi-generation households in past times is relevant for our understanding of historical residential patterns and micro-social structure. Yet its significance goes far beyond uncovering a historical fact. The answer is also crucial in correctly assessing recent demographic changes, their influence on population age composition and kinship structure, and their socioeconomic consequences.

In many historical populations, the formation of large multigeneration households was considerably influenced by demographic regimes of high mortality and high fertility. This study uses computer microsimulation to examine the demographic feasibility of people living in such households and the changes in such feasibility over the course of people's lives under the demographic conditions similar to those existing in Chinese history. While the investigation focuses on the Chinese experience, it also sheds light on the likely impact of rapid demographic changes on future family support for the elderly, an issue of great concern to other countries as well.

Residential patterns in historical China: Debate and confusion

China's historical household has been a popular subject for study for many years. Yet highly divergent opinions and considerable confusion surround China's past residential patterns. The controversy relates largely to three areas: the composition of households in the past, the household formation systems, and the support systems for the elderly.

The belief that the large multigeneration household was the dominant type of household in China had earlier been widespread among scholars. This notion, however, was challenged by a number of studies conducted during the mid-twentieth century. On the basis of her own investigation and findings of other surveys, Lang claimed, for example, that "the joint

family is not and never was the 'normal' type of Chinese family" (Lang 1946: 10). Freedman also argued that the large joint family "could not have existed as a common form of the family because of the statistical fact that the average size of the domestic family was between five and six souls" (Freedman 1979: 235). He insisted that "the typical (usual) family is small and morphologically either elementary or stem; the ideal family is 'joint' and rare. This is...a general statement about the family in China" (Freedman 1966: 43). Similar statements were made by others. Both Fairbank and Goode, for example, offered their support to Freedman's claim by suggesting that although Chinese and Western literature had focused on the large multigeneration family, it appears to have been "the ideal exception" and "a luxury" (Fairbank 1979: 26). "None but the well-to-do was ever able to maintain an extended family network in one household" in the past (Goode 1963: 296). These opinions became so popular during this period that, as noted by Freedman, "a round denunciation of the older view that the 'large' or 'joint' family is the typical family of China" had become almost "customary" in the discussion of the Chinese family system (Freedman 1958: 19).

The view that many Chinese lived in large multigeneration families has nonetheless survived the attack. In recent years a number of scholars have readdressed the widespread nature of the large household in historical China. Their research showed that "the so called large, extended, or joint form of the family was commonplace" in several populations under investigation (Cohen 1976: xiii). Wolf, for instance, reported that in nine districts in northern Taiwan in the years 1906 to 1946, more than 50 percent of households had a stem, grand, or frereches structure,¹ and more than 70 percent of the population lived in such households. Based on these statistics and survey results collected from mainland China, he claimed that "Chinese farm families were potentially large everywhere and actually large whenever material conditions were somewhat better than miserable" (Wolf 1985: 49). The investigation of a number of historical populations of northeast China, conducted by Lee and his colleagues during the last two decades, also found that multiple-family households accounted for about 50 percent of all households and that the majority of the population lived in households of this type (Lee and Gjerde 1986; Lee and Campbell 1998). My own preliminary study of the population of Kaiyuan, another historical community of northeast China, revealed the same patterns (Zhao 1988).

In relation to this debate, it is also important to point out that some extreme claims favoring the prevalence of large multigeneration households also exist. It has recently been suggested that the traditional Chinese household was characterized by four generations living together (Tang and Xie 1993: 807); or even that "five generations under one roof represented the family ideal" and that the proportion of such households might have reached 6 or 7 percent in the past (Eastman 1988: 16).²

The second controversial area relates to the question of what rules governed how households were formed and dissolved in the past. In this context historians and anthropologists are interested in the social norms governing residential patterns and culturally mediated propensities favoring such patterns. These social norms and propensities are often referred to as “household formation systems,” “residential rules,” or “models” (Freedman 1979; Hajnal 1983; Goody 1996; Skinner 1997; Fauve-Chamoux and Ochiai 1998). In the study of past social structure and residential patterns, China’s large complex families and household formation systems are frequently regarded as extremes, against which simple families and nuclear (or even stem family) household formation systems are compared (Hajnal 1983; Wolf and Hanley 1985; Cornell 1987; Saito 1996). Yet widely divergent views on what kind of household formation rules operated in the past have been advanced.

Freedman, for example, claimed that there were two distinct models of the Chinese family: the model of rich families and the model of poor families. A rich family produced several sons, who remained in an undivided family as long as the parental generation survived. In the “rich model,” joint, complex families succeeded one another in rapid succession. In contrast, in the “poor model,” the cycle of development was short and nuclear families emerged rapidly from more complex units. Only one married son resided with his father while other sons departed. When the head of household died there was little reduction in the complexity of household structure (Freedman 1979). Freedman defended this thesis by arguing that “a single model...will not do for China (or for any other highly differentiated society). Two models can represent the range of reality” (*ibid.*: 238). Similarly, Guan suggested that in recent history only rich people such as landlords and the well-to-do wished to maintain large families. Most poor peasants, particularly laborers, established their own nuclear family households when they married (Guan 1987).

A number of studies, however, document joint families among both rich and poor.³ In Hai-Shan, a settlement in the southwestern corner of the Taibei basin, for example, Wolf and Huang found that among the married couples they traced between 1906 and 1926, 74 percent had gone through a “grand” family household stage. Those who had not experienced anything more complex than an elementary family made up only 6 percent. They accordingly claimed that though people in Hai-Shan were poor, the family cycle was “rich” (Wolf and Huang 1980: 68–69). Hajnal also insisted that the joint household formation system typified the Chinese experience. According to Hajnal’s classification, only Freedman’s “rich version” of household formation was followed by the Chinese in the past (Hajnal 1983). Ma, too, suggested that while most complex households were found among rich families, the poor also followed joint family formation rules. Married sons did not depart from the households of their parents (Ma 1988).

The third area of confusion concerns family support for the elderly in the past. Although scholars and other commentators have acknowledged that mor-

tality was very high in the past, they do not seem to have recognized that this could have had a serious impact on the family support of the elderly. It is strongly believed that, as a key feature of China's feedback support system, old people were looked after by their children, especially their sons.⁴ Such an arrangement has long been regarded as "the only option" for the elderly (Du and Tu 2000). This view has been reiterated in recent discussions of China's family planning program, fertility decline, and population aging.

Parents' desire to have sons to support them in old age has been widely seen as a major obstacle to implementing China's family planning policies. Similarly, the diminishing role of the family in taking care of the elderly has been frequently listed as an inevitable consequence of China's accelerated fertility transition. One assumption of this reasoning is that support from sons or children was always readily available for old people in the past, but the rapid fall of fertility has altered this pattern and will continue to do so. "The decline in number of children, especially sons, could pose serious threats to the traditional family support system" (Kallgren 1993: 177). Facing the daunting task of providing adequate care for the fast-growing old-age population, China's policymakers and scholars have also repeatedly emphasized the long tradition of family support for the elderly and its indispensable role in overcoming the difficulty caused by population aging.

Although broadly consistent with China's past experience, these beliefs and suggestions idealize and simplify past residential patterns. Issues such as demographic constraints on past family support systems have frequently been ignored, and family support provided by sons to their parents has been exaggerated. Consequently, historical change in kinship structure in the Chinese population has been misinterpreted. Moreover, researchers have often used different types of data, employed different approaches in their studies, and adopted different terminologies in defining households and interpreting their findings. All these factors have made their results difficult to compare and contributed to the divergent opinions concerning China's historical residential patterns. In general, however, the controversy and confusion have stemmed from three deficiencies.

The first is the lack of hard empirical evidence of historical residential patterns, especially for pre-twentieth-century China. Before the 1980s, statistical analysis of pre-twentieth-century Chinese households and people's household formation behavior was rare. Little was known about the living arrangements of ordinary people. Historical data allowing this kind of investigation were difficult to come by. Many discussions of pre-twentieth-century Chinese households are based largely on two types of data sources. The first is surviving aggregated population and household figures. Data of this kind cover a long period, but they often suffer from underregistration and inconsistencies in definitions used in collecting them. For certain historical periods, the mean household size computed directly from these figures is unrealistically low. These records are responsible for the suggestion

that over the last 2,000 years the mean size of Chinese households varied between 2.5 and 7 persons (Xia 1987: 102; Guo 1995: 9). The second data source is the materials about large multigeneration households found in various historical records and popular writings. These records sometimes use vague terms in describing coresidential patterns. They also lack details and are difficult to verify. Nevertheless, records of this kind seem to have had a fairly strong impact on people's perception of large historical households.

The second deficiency is the lack of investigation into demographic influences on kinship structure and household formation. Scholars had long been aware of the importance of such studies. Some estimations, albeit crude and lacking in detail, were made years ago (Coale 1965; Levy 1965; Glass 1966; Wrigley 1969). More recently, social historians and anthropologists have addressed these issues on the basis of their empirical findings (Harrell and Pullum 1995; Liu 1995). Notable progress in evaluating demographic impacts on the formation of kinship networks and household composition awaited the development of computer simulation. Despite some advances, however, the number of comprehensive studies is still far from adequate, and the discussion itself has been largely confined to a small group of specialists. Therefore, it is not surprising that these questions have been frequently overlooked in discussions of historical residential patterns. In other instances, scholars recognizing demographic constraints in traditional households offer rather unrealistic speculations.⁵

The third deficiency is the lack of integration of cross-sectional and longitudinal approaches. Before the 1980s, most studies of Chinese households were carried out by examining cross-sectional data, in part because of the difficulty in obtaining information needed for a longitudinal study. Yet the pattern of household composition observed from cross-sectional data is simply a snapshot of a person's (or a group's) residential situation at one point in time. It is only a fraction of that person's (or group's) lifetime residential experiences. The chance a certain person will be found in a large complex household is affected by at least three factors: the impact of household formation systems in the population, the severity of demographic constraints on the formation of large multigeneration households, and the stage of the life cycle in which the person lives at the time. Hence, the presence of a small proportion of large complex households found in cross-sectional data may not mean that the majority of the population favored small households. This is particularly the case when demographic conditions are severe. Accordingly, failure to link the lifetime residential experiences of individuals to the composition of the households in which they live at any given time could lead to incorrect conclusions about the nature of the Chinese household formation system.

The present study, by combining cross-sectional and longitudinal approaches and by using computer microsimulation, aims to provide further information about past coresidential patterns. It demonstrates that under

demographic conditions similar to those recorded in China in the past and under residential rules similar to those termed by Hajnal as joint family formation systems, actual residential patterns could be highly diverse. Despite the fact that large multigeneration families were generally encouraged in Chinese history and that many people could have lived in domestic groups with a complex structure at some stages of their lives, simple family households might also have been widespread.

The impact of past demographic conditions on the formation of large multigeneration households

Extensive research has shown that, in many countries until recently, demographic regimes were dominated by high mortality, high fertility, and low population growth (McEvedy and Jones 1978; Anderson 1988; Wilson and Airey 1999). Historical China was no exception.

Investigation into China's demographic history has entered a new era since the 1980s. Differing from earlier research, recent studies have been increasingly based on the examination of surviving census materials, household registers, and genealogical records. They provide fairly detailed information about past fertility, mortality, and marriage patterns (Liu 1992; Harrell 1995; Lee and Campbell 1997; Zhao 1997a; Lee and Wang 1999). Owing to these developments we are now in a much better position to make the following generalizations about China's past demographic conditions.

Marital fertility in historical China, in contrast to the common assumption, was not very high. The total marital fertility rate was between 6.5 and 7.5 births per woman in most of the historical populations investigated so far. This level is much lower than those recorded in many European countries prior to the demographic transition. While China's marital fertility rate was only moderate in the past, its total fertility rate was relatively high—between 5 and 6, a level comparable to those observed in many premodern European populations. This seemingly contradictory result arises because the large majority of Chinese women married and started childbearing at younger ages than their European counterparts. This tends to reduce the difference between the total marital fertility rate and total fertility rate (Barclay et al. 1976; Coale 1985; Liu 1985; Zhao 1997b; Lee and Wang 1999).

Mortality was high in the past. Life expectancy at birth for many historical Chinese populations likely was below 30 years. Because a considerable number of female infants were the victims of infanticide and negligence, and females in general had low social and family status, young girls and middle-aged women generally experienced higher mortality than their male counterparts. Life expectancy at birth for females was often lower than for males. Although mortality decline was observed in certain historical populations and substantial variations and fluctuations in mortality levels

were not uncommon, no nationwide long-term improvement in mortality was recorded until the mid-twentieth century (Telford 1990; Liu 1992; Lee, Wang, and Campbell 1994; Campbell 1996; Zhao 1997a; Lee and Wang 1999).

Early marriage has been regarded as one of the defining features of China's marriage pattern and its household formation system (Hajnal 1965 and 1983). In most historical Chinese populations, virtually all women had married by age 30 and the mean age at first marriage was likely to have been below 18 years. The majority of Chinese men also married relatively young, but the universal marriage pattern did not apply to them. Some men married in their 30s or 40s, and the proportion who never married was well above 5 percent. In addition, a substantial number of people became widowed at relatively young ages because of the early death of their spouses. Remarriage was practiced fairly widely among both males and females (Chen 1991; Telford 1992; Lee and Wang 1999).

Two questions arise. First, what was the effect of such a demographic regime on China's long-term population growth? Computer modeling suggests that if the aforementioned mortality, fertility, and nuptiality patterns remained unchanged in a society, then the population would increase at an annual rate of about 4 per thousand. This rate is probably lower than that in China during the eighteenth and early nineteenth centuries, but it may be close to the average population growth rate recorded between the early sixteenth century and the mid-twentieth century. Before the sixteenth century the annual population growth rate was most likely below 4 per thousand.⁶ The broad agreement between the two sets of growth rates suggests that the above mortality, fertility, and nuptiality indicators can be regarded as reasonable, if obviously tentative, estimates of the average population growth rates in China over the last millennium. Because of the fluctuations in past mortality, fertility, and nuptiality patterns, conclusions about average growth rates have only limited use, especially when we try to correlate socioeconomic development with the rate of population growth in a particular area or during a specified period. Nevertheless, these generalizations provide us with a crude demographic frame and allow some developmental issues to be better evaluated.

Second, what was the impact of such demographic conditions, high mortality in particular, on the formation of large multigeneration households? According to the Coale–Demeny model life tables, with life expectancy at birth of 30 years, approximately 40 percent of the population would have died before reaching age 10, 50 percent before reaching age 20, and 60 percent before reaching age 40 (Coale and Demeny 1983). This level of mortality is likely to be very close to, perhaps slightly lower than, the average mortality level in historical Chinese populations. Under mortality of this magnitude and the given fertility and marriage patterns, how many individuals could have lived in large multigeneration households, and how many

old people could have been taken care of by their sons? The search for answers to these questions is the focus of the rest of the article.

Computer microsimulation and the investigation of past residential patterns

Computer simulation is a technique in which researchers use computers to conduct “experiments” and examine the implications of interactions that are difficult for conventional methods to handle. In a demographic microsimulation, a model population with a certain age and sex structure is generated by the computer. Changes in the population, such as deaths, births, and marriages, are simulated at the level of the individual according to a set of predetermined probabilities that govern the occurrence of these events. Detailed records of the events and some aggregated statistics are all generated by the simulation system.

Since the 1970s, a number of computer microsimulation systems have been developed and used in the study of household composition and changes in kinship structure (Dyke and MacCluer 1974; Wachter et al. 1978; Ruggles 1987; Smith 1987; Galler 1988; Tu, Freedman, and Wolf 1993). Although criticism has been directed at the use of computer simulation in demographic research from the start and some scholars have become skeptical about the credibility of their simulation models (Fitch 1980; Ruggles 1993), recent research demonstrates that computer microsimulation provides a valuable tool for the investigation of past social structure and population changes (Hammel et al. 1991; Hammel and Mason 1993; Lin 1994 and 1995; Hammel and Wachter 1996a and 1996b).

The simulation system used in the present exercise is called CAMSIM. Designed by James Smith at the Cambridge Group for the History of Population and Social Structure in the early 1980s, it has been subsequently improved by Smith and Oeppen. This system has been employed in a number of studies (Smith 1987 and 1991; Smith and Oeppen 1993; Zhao 1994, 1996, and 1998). Since technical details of the system have been discussed elsewhere, they will not be repeated here.⁷ Instead, this section will concentrate on some relevant issues relating to its application in this study.

From a demographic viewpoint, how many people could live in large households is largely affected by how many of them would have kin of certain types. The availability of kin is in turn determined by fertility and mortality levels and marriage patterns, if it is assumed that childbearing takes place primarily within marriage.⁸ This assumption is consistent with the social norm in many historical populations. Since this article focuses on the demographic potential for people to live in large complex households rather than on their actual residential patterns, the impact of migration is not a major concern. Accordingly, if we know the fertility and mortality levels and the marriage pattern

in a population, the number and the types of relatives that people could have at different stages of their life course can be simulated and the demographic feasibility of forming a large multigeneration household can be assessed.

In this exercise, CAMSIM is first used to produce a model population. In doing so, the system applies an ego-centric approach. It starts by simulating an individual and his (or her) demographic history. This individual, called an ego, is treated as the central figure in his (or her) kin set. The system then generates various kinds of kin for the ego. The type and number of kin to be simulated are controlled by input parameters and can be altered according to the purpose of the investigation. When the simulation of the first ego and his (or her) kin set is completed, the system puts the records into storage and starts simulating the second ego and his (or her) kin set. This procedure can be repeated to obtain the required number of egos determined by the researcher.⁹ These simulated egos can be regarded as a sample of unrelated individuals drawn from a birth cohort that had experienced a stable demographic regime.¹⁰ Only male egos and their kin have been simulated in this exercise, though it is equally feasible to do the same for females. The use of male egos was preferred in view of the patrilocal residence widely practiced in Chinese history. Thus comparisons of empirical findings with simulated residential patterns of male egos are more convenient.

Differing from some other simulation systems, CAMSIM uses the following approach to simulate marriage for each individual. When a man or a woman is scheduled to marry, a spouse of the appropriate sex and age is generated by the system rather than selected from the existing population. In this respect, CAMSIM is an “open” model (Wachter et al. 1978; Smith and Oeppen 1993). Adopting this strategy enables the requisite proportion of people to get married and ensures the accurate distribution of age intervals between spouses, even when the simulated population is relatively small. But this procedure excludes the possibility of examining the impact of the situation in the marriage market, which could be crucial in the study of a small population with a closed marriage market. Since this exercise aims to provide only general information about residential patterns in historical China, this disadvantage is not of great concern.¹¹

In generating the kin set for each male ego, CAMSIM simulated his relatives for nine generations—namely, four ascending generations, four descending generations, and the generation to which the ego belongs. Children of four descending generations are simulated for each member of the first five generations (i.e., the generations of egos’ great-great-grandparents, great-grandparents, grandparents, parents, and that of egos themselves). On the top of the pedigree are egos’ great-great-grandparents, and at the bottom are their great-great-grandchildren. Altogether, 3,000 male egos and their kin sets have been simulated. This model population comprises some 12 million people. The mean size of egos’ kin sets is just over 4,000 people.

Demographic conditions observed in this model population, reflecting the chosen input parameters, are as follows. Life expectancy at birth is around 30 years for men and 27.5 for women. The total fertility rate is 5.3. Age at first marriage is about 18 years for women and approximately 21 for men. While 99 percent of women would have married by the time they reached age 40, 7 percent of men remain single after this age. The intrinsic growth rate in the population is about 4 per thousand and the net reproduction rate is 1.10. These demographic indicators are very similar to those discussed above, which were regarded as fairly close to the long-term averages of China's past mortality, fertility, and marriage patterns.

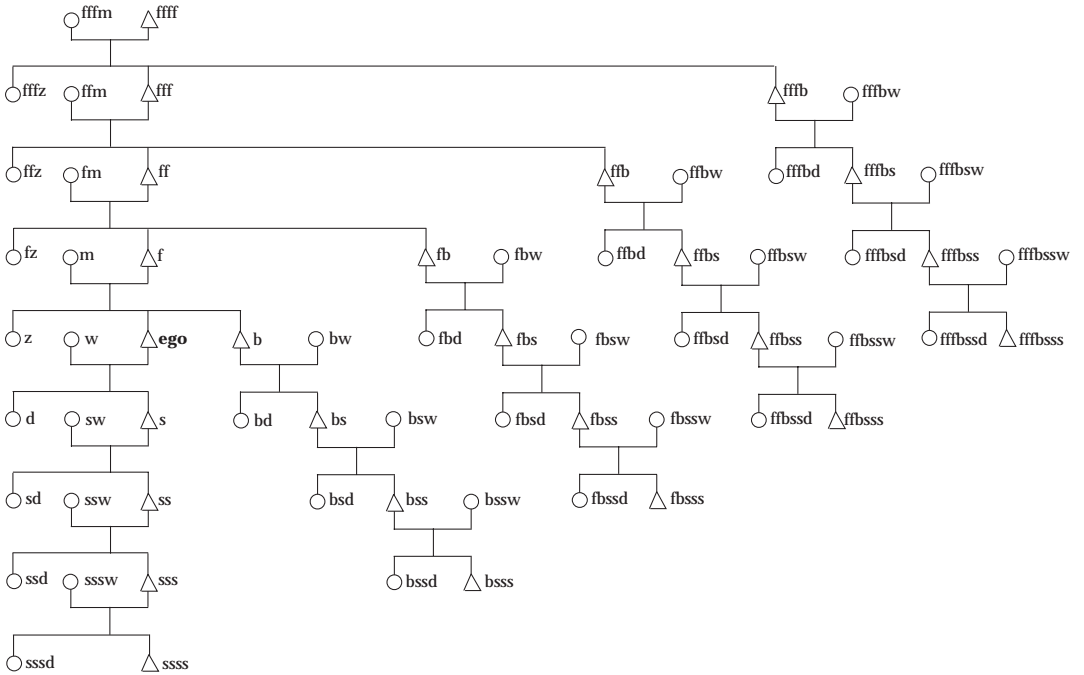
After the model population has been generated, the demographic feasibility of forming a certain type of household is examined under a set of assumptions about household formation rules or residential propensity. Setting up such rules is essential to the simulation study. Otherwise, people who are linked through kinship relations, regardless of how remote such relations may be, would all be entitled to be considered in the "formation" of a household. This would not only increase the difficulty of the simulation, but would also lead to unrealistic results.

This study adopts the following residential rules. 1) No man is allowed to move out of his parents' household before the death of both his parents, his father's parents, his father's father's parents, and his father's father's father's parents. 2) All women leave their parents' households and join the households of their husbands at marriage, while unmarried women stay with their parents. 3) Siblings (or uncles and their nephews and nieces), regardless of their marital status and age, establish their own households when all their parents, father's parents, father's father's parents, and father's father's father's parents (or their common ancestors) have died. Since this set of rules is similar to the joint family formation systems described by Hajnal (1983), they will be referred to as joint family formation rules in the following discussion.

These patrilineal household allocation rules are used because they are broadly in agreement with China's historical reality.¹² Admittedly, these rules have some arbitrary elements. It is unlikely that they would have been strictly followed in any large population. In some communities, for example, many households remained together long after the parents were dead (Lee and Campbell 1998), but in others a considerable number of families divided while the parents were still alive (Guan 1987). Nevertheless, the major assumptions used in the simulation appear consistent with what is known about historical China.

When these household allocation rules are applied to the model population, 64 types of relations from nine generations are selected in the examination of egos' potential residential patterns. These types of kin are shown in Figure 1. To maximize the chance of people living in large multigenera-

FIGURE 1 Types of kin included in the simulation study



NOTES: △ : male ○ : female
 f : father m : mother
 b : brother z : sister
 s : son d : daughter
 w : wife

Examples: ffz: ego's father's father's sister; bsw: ego's brother's son's wife

tion households, the remarriage of egos' male relatives has been simulated and their successive spouses are included in the study, whereas the remarriage of egos' female relatives has not been considered.¹³ In addition to the input demographic rates and the specified residential rules, the type of kin included in the analysis is another crucial factor that could directly affect the outcome of the simulation.

Before turning to the simulation results, two further points must be emphasized. First, although considerable effort was made to ensure that the simulated demographic process is realistic, a simulation study is different from empirical research. Strictly speaking, simulation outcomes do not tell us what has actually happened in a real population; rather, they explore the implications of the input demographic and nondemographic conditions. Second, while simulations of this kind have some inevitable limitations, they offer us valuable insights into past residential patterns that are difficult to obtain through conventional methods.

Simulation results

Residential patterns can be examined from the perspective of either the individual or the household. The question how many people in a population live in large multigeneration households is different from that of how many multigeneration households are in the population.¹⁴ In this section individuals rather than households are chosen as the unit of analysis.

Both cross-sectional and longitudinal approaches are used in the analysis of the potential residential pattern of every simulated ego. Attention is given not only to the ego's household composition at a particular point in the life course,¹⁵ but also to the transition in the ego's household structure over time and the number of years the ego spent in households of different types. This allows us to monitor the impact of changes in life course on household composition and to measure the lifetime residential experience. The simulation results are described in the following three sections.

How many people could have experienced multigeneration coresidence?

We start with the generational structure of households in which simulated egos would have lived at various stages of their lives. Percentage distributions of male egos by generational composition of their households are presented in Table 1.¹⁶

As noted earlier, some scholars have speculated that five-generation households could have accounted for more than 5 percent of all households in the past. But the simulation results show that under the given demographic conditions and the household formation rules, the chance of a person living in a five-generation household is extremely low. At all specified ages, proportions of egos who could have lived in a five-generation household are well below 5 per thousand. For this reason, in the table they are combined with proportions of people living in four-generation households.

TABLE 1 Percentage distribution of male egos by generational composition of their households at specified ages

Number of generations	Age of ego							
	0	10	20	30	40	50	60	70
One	0.0	1.8	8.4	8.0	10.8	20.3	26.2	33.9
Two	31.5	47.4	42.8	28.3	45.0	40.9	22.2	11.0
Three	58.0	44.0	39.9	57.5	39.8	29.7	47.5	49.0
Four or more	10.5	6.8	8.9	6.2	4.4	9.1	4.1	6.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
N	3,000	1,763	1,630	1,415	1,182	924	631	292

Ten percent of egos could have lived in a household with four or more generations at the time of their birth. This is the highest value among those recorded at the eight specified ages of the ego. While proportions residing in such households are also relatively high at ages 20 and 50, they account for less than 7 percent at other specified ages. Living in a four-generation household thus seems fairly difficult to achieve.

In contrast, egos can often be found in a household with three generations. Nearly 60 percent of egos could have lived in such households at birth and when they reached age 30—two points in people’s lives when multigeneration households are relatively easy to form. At all other specified ages, the proportion of egos who lived in three-generation households is less than half.

The proportion living in one- or two-generation households is not low. More than half the egos could have lived in such households at some of the specified ages. It is striking that the proportion of egos residing in a one-generation household shows a continuous increase, from under 10 percent at age 20 to more than 33 percent at age 70. This trend reflects the fact that as the egos age, their parents gradually die and their daughters marry into the households of their husbands. If these egos do not have surviving sons, they are likely to end up in a household with only one generation.

The high proportion of egos living in a household with only one generation is also related to the fact that in this study all egos are males. Since a higher proportion of men than women remain single, the males’ chances of living in large complex households and being supported by their sons are lower than for their female counterparts. Such a difference seems to reflect historical reality.

A low proportion of people living in certain types of households at a particular age does not necessarily mean that few people experience life in such households. Hence, it is also important to examine how many egos have ever resided in households of different generational structures by the time they have reached some specified age. The simulation results are shown in Table 2.

TABLE 2 Proportions of male egos (percent) who ever lived in households with a given number of generations by the time they reached specified ages

Number of generations	Age of ego							
	0	10	20	30	40	50	60	70
One	0.0	1.8	9.1	16.5	23.4	32.4	38.0	45.9
Two	31.5	53.9	73.9	82.8	87.9	91.6	91.9	90.1
Three	58.0	67.2	80.1	93.2	94.2	94.7	96.0	95.9
Four or more	10.5	14.9	24.3	30.0	33.5	43.2	44.5	48.6
Three or more	68.5	72.3	82.6	93.9	94.8	95.3	96.5	96.2
N	3,000	1,763	1,630	1,415	1,182	924	631	292

Two observations can be made by examining these figures. First, living in a household with one or two generations could be a very common experience under the given conditions. For example, about a quarter of egos reaching age 40 and nearly 40 percent of those reaching age 60 have at some time lived in a household with only one generation. By age 20, 75 percent of the egos have already experienced family life in a one- or two-generation household. The proportion further rises to more than 90 percent among those aged 50 and older.

Second, the proportion having ever lived in households of four generations or more also shows a steady and substantial increase. At age 10, only 15 percent of egos have ever resided in a household with four or five generations. But the figure increases to 30 percent among those reaching age 30, and rises to about 50 percent among those surviving to age 70. It should be kept in mind, however, that the majority of the egos died young. Less than one-third lived more than 50 years. Hence, the proportion of those having ever lived in four- or five-generation households is still fairly low within the entire birth cohort. For example, when egos' life courses are followed to age 70, we find that only 27 out of the 3,000 could have experienced coresidence in households of five generations at certain stages of their lives. The chance thus is below 1 percent. Egos who have ever lived in households consisting of four or five generations account for 27 percent of the cohort of 3,000.¹⁷ In addition to these two observations, the figures once again suggest that the majority of the population would have experienced life in a three-generation household.

Another way of investigating multigeneration coresidence is to examine how long people would have lived in households with a certain generational structure. Table 3 lists the mean number of years that egos would have spent in households of one, two, three, or four and more generations by the time they reached specified ages.

Egos surviving to age 20, for example, have on average spent less than one year in one-generation households, about nine years in two-genera-

TABLE 3 Mean number of years spent in households with a given number of generations by the time male egos reached specified ages

Number of generations	Age of ego						
	10	20	30	40	50	60	70
One	0.1	0.6	1.3	2.3	3.9	6.4	10.0
Two	4.1	8.9	12.1	15.7	20.0	22.8	23.7
Three	5.1	9.0	14.3	19.3	22.5	26.4	31.5
Four or more	0.7	1.5	2.3	2.7	3.6	4.4	4.8
Total	10.0	20.0	30.0	40.0	50.0	60.0	70.0
N	1,763	1,630	1,415	1,182	924	631	292

tion households, nine years in three-generation households, and one and a half years in four-or-more-generation households. The mean length of time that people would have lived in four-or-more-generation households is short. Those reaching age 40 would have lived in such households for less than three years and those surviving to age 70 for nearly five years. Egos aged 50 and older have in fact spent a longer time in households consisting of one generation than in households including four or more generations. Broadly, under the given demographic conditions and household formation rules, people would spend slightly more than half of their lifetimes in households of three or more generations. The rest of their time would be spent in households with one or two generations. While the proportions of time that egos resided in households of two, three, and four or more generations are relatively stable or show only a slight decrease after age 40, the proportion of time they lived in one-generation households increases considerably—from one percent at age 10 to about 15 percent at age 70.

How many of the elderly could have been supported by their sons?

The simulation results above indicate that under the demographic conditions specified for the model population, a considerable number of old people would not have been supported by their sons. However, because the issue of family support given by sons to their parents is of great importance in our understanding of caring systems of the past and prospects for such systems in the future, it is useful to look more closely at the matter.

Table 4 shows the percentage distribution of male egos by the number of surviving sons they would have at various ages. According to the simulation, some two-fifths of the egos aged 40 or older have two or more surviving sons. In addition, slightly more than a quarter of egos aged 40 or older have one surviving son. Thus about two-thirds of the egos can hope for support from their sons. These percentages remain roughly stable. Remarkably, however, from age 40 onward around one-third of male egos do not

TABLE 4 Percentage distribution of male egos by number of their surviving sons at specified ages

Number of surviving sons	Age of ego						
	40	45	50	55	60	65	70
None	33.8	31.0	30.8	31.1	33.3	36.9	37.7
One	27.3	26.7	26.9	26.3	25.7	27.0	28.1
Two or more	38.9	42.3	42.3	42.6	41.0	36.1	34.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
N	1,182	1,049	924	767	631	463	292

TABLE 5 Proportions of male egos (percent) without surviving sons who have surviving kin of given types at specified ages

Kin	Age of ego						
	40	45	50	55	60	65	70
Wife	51.4	42.8	36.8	35.3	30.5	28.1	24.5
One or more daughters	40.4	38.8	37.2	37.4	37.1	37.4	36.4
One or more daughters-in-law or son's sons	0.3	0.9	2.5	5.9	7.1	8.8	8.2
One or more brothers	68.2	63.1	60.0	55.5	47.1	36.3	27.3
None of these types	13.5	17.5	21.1	21.0	25.7	29.2	38.2
N	399	325	285	238	210	171	110

have surviving sons. The high proportion of men with no surviving sons results from the following. A considerable number of egos remained single; some of those who married were not able to become fathers because of the early death of their spouses or sterility; for those having children, some had only daughters, while the sons of others predeceased them.

These results suggest that family support provided by sons could not have been the only arrangement for the elderly. For the one-third of elderly men with no surviving sons, family support must have come from other sources, if available. Accordingly, the availability of kin of other types has also been examined in the simulation. The relevant information is presented in Table 5.

According to the simulation, half of egos without surviving sons have a wife alive at age 40, and more than 60 percent have one or more surviving brothers before reaching age 50, although the proportions having a surviving wife or brothers decline noticeably as egos age. In addition, about 40 percent of those without a surviving son have at least one surviving daughter. Among those over age 60, nearly 10 percent also have one or more surviving daughters-in-law or grandsons with whom to form a household. Such results suggest that old people who do not have surviving sons may be able to turn to other close relatives for help. Nevertheless, the simulation also reveals a considerable number of men for whom such relatives are not available. The results presented in Tables 4 and 5 imply that more than 10 percent of all male egos aged 60 and older have neither surviving sons nor other surviving close kin. It would be difficult for them to get support from the family without pursuing other strategies—for example, adopting a son.

How many people could have lived in large complex households?

This section focuses on household size and household composition. In the study of historical households, one of the most widely used classification

schemes was developed by Hammel and Laslett. A modified version of the Hammel–Laslett scheme is used here.¹⁸

The simulated households are classified into four groups according to the number of conjugal family units within a household and the relationship between them. A conjugal family unit consists of a married couple alone, a married couple with their unmarried children, or a single parent with unmarried children. The four groups of households are defined as follows. The simple household refers to households with one conjugal family unit only or to those without conjugal family units, including households having only a single person. The extended family household has one conjugal family unit with other relatives present. The stem family household is formed by at least two conjugal family units in which the married couples or ever-married people belong to different generations. The joint family household also consists of two or more conjugal family units, but the married couples or ever-married people are from the same generation. Domestic groups having both a joint and a stem structure are classified as joint family households.

While a set of joint family formation rules has been enforced in the simulated population, the proportion of male egos who would have lived in joint family households at any particular age is seldom dominant. As shown in Table 6, slightly more than 40 percent of the egos were born to joint family households. This proportion peaks at age 30, by which time most egos and their brothers have married. At all other specified ages, the proportions fluctuate between 21 and 33 percent. The proportion of egos living in stem family households is relatively high at ages 20, 50, and 60. A household of this type can easily form when egos are around age 20 as a result of their or their brothers' marriage. Similarly, when an ego reaches age 50 or 60, his household is also likely to display a stem structure if one of his sons gets married.

TABLE 6 Mean size of household and percentage distribution of male egos by household structure at specified ages

Household structure	Age of ego							
	0	10	20	30	40	50	60	70
Simple	30.0	43.7	29.8	29.3	50.4	47.1	38.5	39.7
Extended family	10.5	10.0	7.5	11.5	10.7	7.7	10.6	12.7
Stem family	17.1	14.3	29.5	15.2	9.0	24.0	25.1	16.8
Joint family	42.4	32.0	33.2	44.0	29.9	21.2	25.8	30.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Mean size of household	9.0	8.4	7.5	7.8	7.3	6.2	6.0	6.3
N	3,000	1,763	1,630	1,415	1,182	924	631	292

NOTE: For definitions see text.

Another interesting result is that the proportion of egos living in simple households is fairly high, despite the strict joint family formation rules followed in the simulation. More than one-third of the egos lived in households with this structure at most of the specified ages. At ages 40 and 50, those residing in simple households account for about 50 percent. The proportion of egos living in extended family households is relatively stable at around 10 percent at all specified ages. Most of these households consist of a conjugal family unit plus a widow or a widower.

In the simulation, the mean size of households in which egos lived declines from nearly 9 persons per household when they were under age 10, to about 7.5 persons when they were aged between 20 and 40, and finally to just above 6 persons after they reach age 50. This decrease can be explained by the following facts. When the egos were born, each of their households by definition would have at least one child and a mother alive.¹⁹ If their fathers were also alive, these egos would have lived in households with at least one conjugal family unit, containing two generations and at least three persons. In addition, kin of other types may be present. Accordingly, the mean size of their households is likely to be large. But when these egos grow up, not all marry and not all those who marry have children; moreover most of them would lose their grandparents and parents. By the time the egos grow old, many of their wives and some of their children have died, and most of their daughters have married into other households. Consequently, the mean size of their households decreases. However, if we look at households of only those egos who have sons or grandsons, the mean size of these households at the time when their sons or grandsons are born is very close to the mean size of households at the time when the egos themselves were born.

The figures cited above on mean household size are greater than those reported by most household studies. This is partly related to the nature of the current investigation, which follows the lives of a simulated birth cohort and examines the household composition from the perspective of an individual. If the analysis had been carried out from the perspective of a household, the mean household size would inevitably be smaller.

Table 7 shows the proportion of egos by age who would ever have lived in households of various types. While Table 6 indicates that the proportion of egos found in a joint family household is relatively low or moderate at most of the specified ages, the proportion of those who have at some time lived in such households is rather high. Half of the egos who survived to age 10 had already lived in joint family households during the first decade of their lives. For those having reached age 40 and 70, the proportions rise to 80 and 90 percent respectively. A similar pattern can be observed in the proportions of egos who experienced life in stem family households. If we regard both stem family and joint family households as

TABLE 7 Proportions of male egos (percent) who ever lived in households of given types by the time they reached specified ages

Household structure	Age of ego							
	0	10	20	30	40	50	60	70
Simple	30.0	51.5	68.2	76.1	83.3	89.9	91.1	91.1
Extended family	10.5	16.0	23.3	33.5	39.4	43.5	47.9	52.4
Stem family	17.1	27.6	61.2	78.0	80.3	85.3	88.6	87.0
Joint family	42.4	50.4	62.7	78.1	80.5	83.7	86.8	89.7
Stem and joint family	59.5	66.8	85.8	92.9	93.6	95.0	96.4	96.2
N	3,000	1,763	1,630	1,415	1,182	924	631	292

NOTE: For definitions see text.

households with a complex structure, then more than 85 percent of egos reaching age 20 would have already lived in such households. By age 50 this proportion rises to more than 95 percent.

The proportions of egos who ever lived in simple households show the same pattern. Although only 30 percent of the egos were born in simple households, the proportion of those who had ever lived in households of this type increases to more than half when the egos reach their tenth birthday. Among egos aged 50 and older, about 90 percent would have lived in simple family households at some point of their lives. Residing in households with a simple structure therefore is also a common experience in the simulated population.

The figures presented in Tables 6 and 7 further suggest that most of the egos could not have lived in one type of household for very long, and many of them must have experienced changes in household composition over their lifetimes.

Table 8 shows the mean number of years that egos spent in households of various types by the time they reached specified ages. The propor-

TABLE 8 Mean number of years spent in households of various types by the time male egos reached specified ages

Household structure	Age of ego							
	10	20	30	40	50	60	70	
Simple	3.8	7.8	10.3	14.4	19.2	23.0	27.1	
Extended family	1.0	1.8	2.8	4.1	4.9	5.8	6.5	
Stem family	1.4	3.6	5.9	6.8	8.5	11.3	12.7	
Joint family	3.8	6.8	11.0	14.7	17.4	19.9	23.7	
Total	10.0	20.0	30.0	40.0	50.0	60.0	70.0	
N	1,763	1,630	1,415	1,182	924	631	292	

NOTE: For definitions see text.

tions of time that egos lived in the various household types are fairly stable. The egos spent slightly more than half of their time in joint family or stem family households. It is noteworthy that the egos spent about the same amount of time in simple households and in households with a joint structure before they reached age 50. After this age the mean number of years the egos will have lived in joint family households becomes somewhat lower. This can be partly explained by the fact that simple households in which egos have no sons cannot further expand, and those egos could only live in a simple household for the rest of their lives. In contrast, egos residing in joint family households may experience a transition to a simple household because of the death of some of their family members.

Table 9 indicates the proportion of egos who experienced no change in their household structure and the mean number of transitions in household structure that egos experienced by the time they reached a certain age. Changing household structure here refers to transitions from one household type to another. Changes involving an increase or decrease in household size or generation depth alone are excluded. The number of transitions is counted on a single-year basis. One transition is recorded if the structure of a household at the time of an ego's *n*th birthday is different from that observed at his birthday one year earlier.

These results suggest that experiencing changes in household structure is very common in the model population. During the first decade of life, for example, more than 40 percent of the egos (who survived to age 10) had already gone through at least one such transition. Those reaching age 30 experienced on average more than two transitions in their household structure. Egos aged 60 and older went through an average of four such transitions. Less than 3 percent never experienced any change in household structure during their lifetimes. It is important to note that this study has used only four types of households to classify domestic groups, hence

TABLE 9 Percent of male egos who have never experienced changes in household structure and mean number of transitions in household structure experienced by male egos by the time they reached specified ages

	Age of ego						
	10	20	30	40	50	60	70
Percent of egos never experiencing changes in household structure	57.1	21.2	8.8	6.1	3.2	1.7	2.4
Mean number of transitions from one household type to another	0.5	1.4	2.3	2.7	3.4	3.9	4.3
N	1,763	1,630	1,415	1,182	924	631	292

to identify changes in household composition. Were the household types further divided, the frequency of changing household structure would be even higher.

Discussion

The approach followed in this study differs from most investigations of historical households. It has been carried out by computer microsimulation rather than based on empirical research, although specifications adopted in the former heavily depend upon the latter. Computer simulation allows the creation of a “laboratory environment” and provides an effective way to isolate the impact of a specified group of factors. The maximum experience of multigeneration coresidence, simulated for each individual under specified demographic and nondemographic conditions, could serve as a benchmark in the study of historical households. Yet the outcomes of the simulation exercise largely rely on the assumptions used as inputs.²⁰ Moreover, demographic and household formation behaviors are necessarily simplified in the simulation system. Some factors that could have made the simulation more realistic have not been incorporated in this study. For these reasons, the simulation outcomes cannot be directly compared with findings of conventional household studies without qualification. Nevertheless, the simulation results improve our knowledge about household formation and composition in historical China.

One conclusion drawn from this exercise is that demographic conditions had a very strong impact on the formation of large multigeneration households in the past. While household formation and composition in any society are influenced by many factors, those directly affecting the formation of a household can be simplified into two: availability of kin and residential propensity. The first is a demographic factor and is primarily determined by the marriage pattern and the levels of mortality and fertility. The second can be regarded as an important component of the cultural traditions and social structural norms prevailing in a society.²¹

This exercise enforces a set of household formation rules that are similar to those underlying Hajnal’s joint household formation system and are generally conducive to the formation of large multigeneration families. All egos would have lived in such households whenever it was demographically possible and permitted by the input residential rules. It has been found, nevertheless, that egos aged 20 and older spent on average about half of their lifetimes in households containing only one or two generations. Between 75 and 95 percent of them lived in such households at some stage of their lives. Similarly, about 90 percent of those surviving to age 50 and older experienced life in simple households. The number of years that egos resided in households with a simple structure is in fact greater than the years

they spent in joint family households. The notions that the traditional Chinese household was characterized by four generations living together (Tang and Xie 1993) and that the proportion of households with five generations might have exceeded 5 percent (Eastman 1988) are not borne out by the simulation. Because the household allocation rules used in the simulation tend to maximize the chance of people living in large multigeneration households, these findings can be regarded as reflecting the impact of the input demographic conditions. Since the demographic regime, high mortality in particular, exerts a strong impact on the pool of available kin, hence on the formation of large multigeneration households, it should be regarded as an indispensable component in the historical analysis of family structure and kin relations.

Skeptics may question whether in the present exercise the selected level of mortality was too high or the level of fertility too low for the historical Chinese population. However, as discussed above, under the specified fertility and mortality levels the model population grows at a rate of about 4 per thousand per year. This is very close to the average population growth rate observed in China between the early sixteenth century and the mid-twentieth century and is most likely higher than the rate prevailing before that time. Past population growth in a largely closed population is determined mainly by the levels of mortality and fertility. Either lower mortality or higher fertility would result in higher population growth. If such rates were introduced into the simulation, the resulting rate of population growth would be higher. What we know about China's historical demographic regimes leaves little scope for assuming higher fertility or lower mortality than the levels specified in the simulation.²²

Another conclusion drawn from this study concerns past residential patterns. In historical China, the formation of large multigeneration households may have been strongly encouraged by social norms and by the state. But because of the demographic constraints, the actual residential patterns may have been far more diverse than implied by the predominant residential rules or by popular belief. As the simulation results show, while some 50 percent of the egos could have resided in stem family or joint family households at most ages under the specified demographic conditions and household formation rules, more than one-third of the egos would have been found in households with a simple structure. Although most of the egos lived in households with three or more generations at some stages of their lives, a considerable number also lived at some time in households consisting of only one generation.

The conclusion above is supported by empirical investigations. Recent studies of historical population registers have found that many Chinese households were large in size and complex in structure and that the majority of the population resided in such households. They have also revealed

that in some historical populations the proportion of households with only a single person was higher than observed in recent national censuses. For example, Lee and Campbell reported that single-person households in Daoyi, a village in northeast China, accounted for about 12 percent of all households between the late eighteenth century and the late nineteenth century (Lee and Campbell 1997).²³ This is considerably higher than the 8 percent of single-person households recorded in 1982 and the 6 percent in 1990 (Zeng et al. 1992).

In addition to showing highly diversified residential patterns, the simulation exercise yields information relevant to the controversy concerning China's traditional household formation systems. In this respect, two observations can be made.

First, the simulation results are different from those derived from conventional cross-sectional data. This makes it difficult to compare the two directly. But it has been estimated on the basis of the outcome of the simulation that, under the demographic conditions and household formation rules specified in the exercise, between 45 and 65 percent of the male population would be found in stem families or joint family households if conventional cross-sectional data had been produced. This is not far from values observed in some empirical studies.

Wolf, for instance, found that in northern Taiwan the proportion of people living in households with a multiple structure always exceeded two-thirds during the period from 1906 to 1946 (Wolf 1984). Lee and his colleagues also reported that in rural Liaoning in the eighteenth and nineteenth centuries the proportion living in multiple family households exceeded 60 percent for most age groups (Lee and Gjerde 1986; Lee and Campbell 1998). These figures are somewhat higher than those indicated by the simulation results. This discrepancy could have a number of explanations. To begin with, demographic conditions in these populations might have been more conducive to the formation of large complex households than those used in this exercise. Similarly, household formation systems in these populations might have been more conducive to multigeneration co-residence than the joint household formation rules applied in the simulation. For instance, some elderly people, especially widows, even though they had no living sons, resided with other relatives. Some married brothers continued to live in the same household after both parents had died. The co-residence of uncles and aunts with their nephews and nieces was also fairly common in some communities. Admittedly, in some cases sons formed separate households before the death of their parents, but this seems less common in the areas studied historically.

Second, the simulation exercise demonstrates that even if residential rules that encourage the formation of large family households are followed universally, and many people reside in such families at some stages of their

lives, they cannot live in such families permanently. Under the specified demographic conditions, the vast majority of egos experienced changes in household structure. On average, they spent only about one-third of their lifetimes in joint family households. For this reason, the proportion of people living in joint family households may not be very high in cross-sectional data, that is, data collected at a particular time. It is not surprising to find that a considerable number of Chinese households were simple in structure even though large multigeneration households were considered ideal. Indeed, the 20 to 30 percent of joint family households found in cross-sectional data may not mean that the tendency for people to form large complex households was weak, but, to the contrary, fairly strong. For the same reason, whenever possible, longitudinal approaches—that is, observations which follow the life course of each individual—should be promoted in the study of residential patterns and people's household formation behavior.

This simulation study also provides new information on China's past systems of caring for the old and on changes in such systems. When assessing China's traditional family support system, we should address not only its major features but also its historical reality. Although the family support system did play an important role in caring for the elderly in the past, it should not be simplified or idealized. Because of the influence of high mortality, residential patterns in many historical families were far from achieving the ideal. The feedback support system was under the strain of high death rates. A shortage of surviving sons was commonplace in many historical communities. The desire of continuing the family line and the hardship of having no surviving sons forced many Chinese to resort to adoption to replace biological descendants (Lee and Wang 1999).

Analyses of surviving Chinese genealogical records have shown that in several historical lineage populations, the proportions of those who had surviving sons at various ages were very close to the proportions obtained through computer simulation. But the proportions obtained from either of these sources are markedly lower than those found in some contemporary populations. A similar difference has also been observed in the mean number of surviving sons available to care for the elderly. In the simulation, the mean number of surviving sons for egos aged 60 and older is only about 1.3 under the demographic regime similar to that in Chinese history. In contrast, surviving sons averaged 2.4, 2.3, and 1.9 for parents aged 60–64, 65–69, and 70–74 respectively in three settlements in Beijing in 1990 (Zhao 1994, 1998). Equally interesting, in contemporary China the proportion of old people living in multigeneration households is close to, or may be even greater than in past times. According to the 1990 census, for example, around 60 percent of persons aged 70 and older resided in households with three or more generations (Guo 1994). This is higher than the proportion suggested by the simulation exercise. The traditional ideal that many people survive to

old age and are supported by their sons seems to have been achieved widely only in recent decades.

It was common in many historical populations for old persons to have no surviving sons or surviving children. For example, the proportion never married was usually higher than 10 percent in preindustrial England (Schofield 1985); in addition, around 10 percent of married couples did not have children (Wrigley et al. 1997). If the impact of mortality is also taken into account, then it is likely that more than 20 percent of elderly people would have no surviving children. Similar demographic patterns could be found in other historical populations.²⁴

As for the future of the family support system in China, the recent steep fertility decline will alter considerably the ratio between the number of elderly and their children. In comparison with the present situation, the availability of children will decrease markedly in the future. But because of improvements in mortality, the chance of children dying before their parents has also been greatly reduced. This largely offsets the negative effect of falling fertility by ensuring that the majority of the elderly will have at least one surviving child. Indeed, if China's present mortality regime, marriage patterns, and replacement-level fertility are maintained in the future, the proportion of old people having no surviving children may still be lower than in the past (Zhao 1998).

This simulation study, based on data collected from China, was designed to examine residential patterns in Chinese history. It did not investigate household formation in other populations or compare household composition between countries. Before the demographic transition, however, high-mortality and high-fertility regimes existed around the world. Marriage patterns and household formation systems similar to those characteristic of China were found in some other populations (Goldschmidt and Kunkel 1971; Wheaton 1975; Kertzer 1989; Das Gupta 1998; Liu et al. forthcoming). Even in countries where household formation systems differed from those in China, the availability of kin might still be close to that found in historical China if those countries also had demographic regimes similar to the Chinese. Given these broad similarities, the findings of this study could also shed light on the understanding of residential patterns in other historical populations.

Notes

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1 According to Wolf, "stem says that a family contains two or more basic units linked by filial ties; grand, that a family contains a minimum of three units two of which are in the same generation and descended

from the third." "Frereches is a catchall class. It says that the family contains two or more units but does not qualify as stem or grand" (Wolf 1985: 34).

2 Lloyd Eastman suggested in his book *Family, Fields, and Ancestors* that in Chinese history "all the sons, together with their wives and progeny, should if at all possible, continue to live together within a single household." After noting that "five generations under one roof represented the family ideal," Eastman speculated that "probably no more than about 6 to 7 per cent of Chinese families, however, attained that ideal" (Eastman 1988: 16).

3 Lang, analyzing data on 2,000 households, found that the proportion of joint families was generally higher among the upper class and the well-to-do. Nevertheless, her data show that in northern Chinese villages approximately 14 percent of farm laborers' and poor peasants' households exhibited joint structure. In the nonindustrial cities in northern China, the proportion of joint families among wage earners and the lower middle class was about 10 percent. Furthermore, among the 208 households recorded in Shanghai, all joint families were found in the households of industrial workers and the lower middle class (Lang 1946: 136-137).

4 Fei has suggested that the Chinese family support system was characterized by a "feedback model" in which each generation cares for the generation of their children, and children, in return, take care of their parents when they become old (Fei 1982).

5 Eastman, for example, believes that China's national life expectancy at birth was only about 30 years in the past; such a mortality regime would have a considerable impact on the formation of large multigeneration households. However, he still thinks that the proportion of five-generation households could have reached 6 or 7 percent (Eastman 1988: 16). As we shall see, this is a very unrealistic figure.

6 Based on data provided by Zhao and Xie (1988), I have estimated that the average annual population growth rate between the early sixteenth century and the mid-twentieth century was about 4 per thousand. Before that time, the average annual growth rate would have been even lower. For further discussion

about the estimation of the average population growth rate of these periods, see Zhao (1997b).

7 For the technical details of CAMSIM, see Smith (1987); Smith and Oeppen (1993).

8 This article does not discuss the impact of deliberate fertility control on the formation of large families, although evidence suggests that people intentionally controlled their fertility in the past. But the impact of deliberate fertility control on the formation of large multigeneration households was relatively small in most historical Chinese populations that have been investigated.

9 For further discussion on the ego-centric approach and kin set, see Smith (1987).

10 James Smith, the developer of CAMSIM, has recently used the system to simulate the impact of changing demographic rates in a single simulation run. In the present exercise, however, all demographic events are simulated under a stable demographic regime.

11 This, however, does not mean that the impact of a marriage squeeze has not been considered in this simulation. That a relatively high proportion of men remains single is to some extent a result of such a squeeze.

12 In Chinese history many laws denied the younger generations property rights if the father or grandfather was alive. If children removed their own conjugal families from their parental households or kept their own purses, severe punishments would be applied. If children did not respect the wishes of their parents or other senior relatives, the punishments were severe as well (Shi 1987).

13 Under the patrilocal residential rules used in the simulation, the remarriage of a female household member means that she will move out of the ego's household. Accordingly, the size of the household will decrease, and perhaps its structure will become simpler too.

14 For example, consider two households, the first a married couple and a child, the second a couple with seven children. If the household is the unit of analysis, 50 percent of households have three persons and 50 percent have nine. The mean size of the households is 6. But if we examine the size of the household from the point of view of each individual, then 75 percent of all persons live in a household

with nine persons and 25 percent in a household with three persons. The mean size of their households is 7.5.

15 In this study, the composition of households in which egos have lived is examined at the time when the egos have reached certain specified ages. CAMSIM simulates first an ego and then his (or her) parents, grandparents, great-grandparents, and kin of other types. Before these kin have been assigned to the ego, dates of their birth, death, marriage, and other demographic events are not determined. All these dates are reckoned only in relation to the birthday of the ego, but not linked to any actual calendar year or month. Such a treatment enables a facile movement forward and backward in time when the kin set for an ego is simulated. But it makes it difficult for the system to handle the influences of unstable demographic conditions. For the same reason, the cross-sectional analysis has been undertaken with respect to the ego's age rather than in relation to any particular calendar year or month.

16 In this and other tables only the "point estimate" of the relevant population parameter is presented. Because the simulated egos can be regarded as a random sample of unrelated individuals drawn from a birth cohort and the size of the sample and its distribution are both provided (or can be computed from the tabulated data), the "interval estimate" or the "confidence interval" of the population parameter can be easily calculated in most cases.

17 Under the joint household formation rules, a four-generation household in which a male ego lives could consist of his step grandmother, one or both of his parents, one or more of his brothers, and his nephews or nieces. Therefore the chance of an ego living in a four-generation household is greater than that of the coresidence of four generations of the ego's grandparents, parents, the ego himself, and his own children.

18 The Hammel-Laslett scheme first divides households into five groups: single-person households, no-family households, simple family households, extended family households, and multiple family households. Within each category, households are further classified into several subgroups. The stem family household and joint family household are both

included in the category of multiple family households. Because this study on the one hand concentrates on the discussion of joint family households, and on the other hand tries to make the household classification simpler, the Hammel-Laslett scheme has been slightly modified. For details about the Hammel-Laslett scheme, see Laslett (1972) and Hammel and Laslett (1974).

19 In practice a mother may die when she gives birth, but in this exercise demographic events are simulated month by month and the death of a mother has been assumed to occur after the ego is born. All egos, therefore, live with their mothers at the time of their birth.

20 This naturally leads to three further questions. First, given the stochastic nature of the simulation, to what extent could the reported results be affected by random variation? Second, how sensitive is the simulation outcome to the change in the stipulated demographic conditions (for example, to changing combinations of fertility and mortality parameters)? Third, which factor (fertility or mortality) has a stronger impact on the formation of large multigeneration households? Some efforts have been made to answer these questions. In regard to the first one, preliminary work suggests that the simulation results are fairly stable and the impact of the random variation is relatively small. Although some work has been undertaken to examine the second and third questions, they have not been conclusively answered. On the impact of changing demographic conditions on the kinship structure, see Zhao (1998) and Smith and Oeppen (1993).

21 Admittedly, the actual household formation process is far more complicated and is affected by many factors. There are also considerable interactions between the social and demographic factors, and sometimes they are not easy to separate. For example, it could be argued that marriage age is a crucial component of household formation systems (see Hajnal 1983). Accordingly, a household formation system that encourages large families should also promote early marriage. However, age at marriage could also be affected by some factors in addition to people's desire to form certain types of families. Marriage has been treated here as a demographic factor and ex-

cluded from the household formation norm, even though the two cannot be easily separated in reality. For recent discussion about the impact of family systems on demographic processes, see Skinner (1997).

22 The impacts on residential patterns of permitting fluctuations in fertility and mortality around their mean values are worth further investigation. But it is unlikely that

such fluctuations would change the long-term average of past demographic conditions.

23 Similar results are suggested by my preliminary study of the historical population of Kaiyuan (Zhao 1988).

24 According to Rowland, for example, 21 to 32 percent of Australian women born between 1851 and 1916 remained childless by ages 45 to 49 (Rowland 1998).

References

- Anderson, Michael. 1988. *Population Change in North-western Europe, 1750–1850*. Basingstoke: Macmillan Education.
- Barclay, George W. et al. 1976. "A reassessment of the demography of traditional rural China," *Population Index* 42: 606–635.
- Campbell, Cameron. 1996. "Mortality change and the epidemiological transition in Beijing, 1644–1990," paper presented to the Conference on Asian Population History, Taipei.
- Chen, Youhua. 1991. "Changes in ages at first marriage and first birth in China," *China's Population Science* 5: 39–45.
- Coale, Ansley J. 1965. "Appendix: Estimates of average size of household," in Ansley J. Coale et al., *Aspects of the Analysis of Family Structure*, pp. 64–69. Princeton: Princeton University Press.
- . 1985. "Fertility in rural China: A reconfirmation of the Barclay reassessment," in Susan B. Hanley and Arthur P. Wolf (eds.), *Family and Population in East Asian History*, pp. 186–195. Stanford: Stanford University Press.
- Coale, Ansley J. and Paul Demeny. 1983. *Regional Model Life Tables and Stable Populations*. Second Edition. New York: Academic Press.
- Cohen, Myron L. 1976. *House United, House Divided: The Chinese Family in Taiwan*. New York: Columbia University Press.
- Cornell, Laurel L. 1987. "Hajnal and the household in Asia: A comparativist history of the family in preindustrial Japan, 1600–1870," *Journal of Family History* 12: 143–162.
- Das Gupta, Monica. 1998. "Lifeboat versus corporate ethic: Social and demographic implications of stem and joint families," in Antoinette Fauve-Chamoux and Emiko Ochiai (eds.), *House and the Stem Family in EurAsian Perspective* (Proceedings of the C18 Session, Twelfth International Economic History Congress), pp. 444–466. Kyoto: International Research Centre for Japanese Studies.
- Du, Peng and Tu Ping. 2000. "Population ageing and old age security," in Peng Xizhe (ed.), *The Changing Population of China*. Malden, MA: Blackwell Publishers.
- Dyke, Bennett and Jean Walters MacCluer (eds.). 1974. *Computer Simulation in Human Population Studies*. New York: Academic Press.
- Eastman, Lloyd E. 1988. *Family, Fields, and Ancestors: Constancy and Change in China's Social and Economic History, 1550–1949*. New York: Oxford University Press.
- Fairbank, John. 1979. *The United States and China*. Fourth Edition. Cambridge, MA: Harvard University Press.
- Fauve-Chamoux, Antoinette and Emiko Ochiai. 1998. "Introduction," in Antoinette Fauve-Chamoux and Emiko Ochiai (eds.), *House and the Stem Family in EurAsian Perspective* (Proceedings of the C18 Session, Twelfth International Economic History Congress), pp. 1–19. Kyoto: International Research Centre for Japanese Studies.
- Fei Xiaotong. 1982. "Changes in Chinese family structure," *China's Reconstruction*, July, pp. 23–26.

- Fitch, Nancy. 1980. "The household and the computer: A review," *Historical Methods* 13: 127–137.
- Freedman, Maurice. 1958. *Lineage Organization in Southeastern China*. London: Athlone Press.
- . 1966. *Chinese Lineage and Society: Fukien and Kwangtung*, London: Athlone Press.
- . 1979. "The Chinese domestic family: Models," in *The Study of Chinese Society: Essays by Maurice Freedman*, selected and introduced by G. William Skinner, pp. 235–239. Stanford: Stanford University Press.
- Galler, H. 1988. "Microsimulation of household formation and dissolution," in Nico Keilman, Anton Kuijsten, and Ad Vossen (eds.), *Modelling Household Formation and Dissolution*, pp. 139–159. Oxford: Clarendon Press.
- Glass, D.V. 1966. *London Inhabitants within the Walls, 1695*. Leicester: London Record Society.
- Goldschmidt, Walter and Evalyn Jacobson Kunkel. 1971. "The structure of the peasant family," *American Anthropologist* 73: 1058–1076.
- Goode, William J. 1963. *World Revolution and Family Patterns*. New York: Free Press of Glencoe.
- Goody, Jack. 1996. "Comparing family systems in Europe and Asia: Are there different sets of rules?" *Population and Development Review* 22: 1–20.
- Guan, Xiufen. 1987. "Household structure and its trend in Guangdong province," paper presented to the Beijing International Symposium on Chinese Population Ageing and Household Structure.
- Guo Zhigang. 1994. "The analysis of family household data in China's 1990 population census," in State Statistical Bureau, *1990 Population Census of China*, pp. 590–602. Beijing: China Statistical Publishing House.
- . 1995. *Changing Population and Households in Contemporary China*. Beijing: People's University Press.
- Hajnal, J. 1965. "European marriage patterns in perspective," in D. V. Glass and D. E. C. Eversley (eds.), *Population in History: Essays in Historical Demography*, pp. 101–143. London: Edward Arnold.
- . 1983. "Two kinds of pre-industrial household formation system," in Richard Wall et al. (eds.), *Family Forms in Historic Europe*, pp. 65–104. Cambridge: Cambridge University Press.
- Hammel, E. A. and Peter Laslett. 1974. "Comparing household structure over time and between cultures," *Comparative Studies in Society and History* 16: 73–109.
- Hammel, E. A. and Carl Mason. 1993. "My brother's keeper: Modelling kinship links in early urbanization," in David S. Reher and Roger Schofield (eds.), *Old and New Methods in Historical Demography*, pp. 318–342. Oxford: Clarendon Press.
- Hammel, E. A. and Kenneth W. Wachter. 1996a. "Evaluating the Slavonian census of 1698. Part I: Structure and meaning," *European Journal of Population* 12: 145–166.
- . 1996b. "Evaluating the Slavonian census of 1698. Part II: A microsimulation test and extension of the evidence," *European Journal of Population* 12: 295–326.
- Hammel, E. A. et al. 1991. "Rapid population change and kinship: The effects of unstable demographic changes on Chinese kinship networks, 1750–2250," in *Consequences of Rapid Population Growth in Developing Countries*, pp. 243–271. New York: Taylor & Francis.
- Harrell, Stevan (ed.). 1995. *Chinese Historical Microdemography*. Berkeley: University of California Press.
- Harrell, Stevan and Thomas W. Pullum. 1995. "Marriage, mortality, and the developmental cycle in three Xiaoshan lineages," in Harrell 1995: 141–162.
- Killgren, Joyce K. 1993. "Strategies for support of the rural elderly in China," in Institute of Population Studies, Chinese Academy of Social Sciences, *Population Ageing in China*, pp. 169–189. Beijing: New World Press.
- Kertzer, David I. 1989. "The joint family household revisited: Demographic constraints and household complexity in the European past," *Journal of Family History* 14: 1–15.
- Lang, Olga. 1946. *Chinese Family and Society*. New Haven: Yale University Press.

- Laslett, Peter. 1972. "Introduction: The history of the family," in Peter Laslett (ed.), *Household and Family in Past Time*, pp. 1–89. Cambridge: Cambridge University Press.
- Lee, James Z. and Cameron D. Campbell. 1997. *Fate and Fortune in Rural China: Social Organization and Population Behavior in Liaoning, 1774–1873*. New York: Cambridge University Press.
- . 1998. "Headship succession and household division in three Chinese banner serf populations, 1789–1909," *Continuity and Change* 13: 117–141.
- Lee, James and Jon Gjerde. 1986. "Comparative household morphology of stem, joint, and nuclear household systems: Norway, China, and the United States," *Continuity and Change*, 1: 89–111.
- Lee, James Z. and Wang Feng. 1999. *One Quarter of Humanity: Malthusian Mythology and Chinese Realities, 1700–2000*. Cambridge, MA: Harvard University Press.
- Lee, James, Wang Feng, and Cameron Campbell. 1994. "Infant and child mortality among the Qing nobility: Implications for two types of positive check," *Population Studies* 48: 395–411.
- Levy, Marion. J. 1965. "Aspects of the analysis of family structure," in Ansley J. Coale et al., *Aspects of the Analysis of Family Structure*, pp. 1–63. Princeton: Princeton University Press.
- Lin Jiang. 1994. "Parity and security: A simulation study of old-age support in rural China," *Population and Development Review* 20: 423–448.
- . 1995. "Changing kinship structure and its implications for old-age support in urban and rural China," *Population Studies* 49: 127–145.
- Liu Ts'ui-jung. 1985. "The demography of two Chinese clans in Hsiao-shan, Chekiang, 1650–1850," in Susan B. Hanley and Arthur P. Wolf (eds.), *Family and Population in East Asian History*, pp. 31–45. Stanford: Stanford University Press.
- . 1992. *Lineage Population and Socio-economic Changes in the Ming-Ch'ing Periods*. Taipei: Institute of Economics, Academia Sinica.
- . 1995. "Demographic constraint and family structure in traditional Chinese lineages, ca. 1200–1900," in Harrell 1995: 121–140.
- Liu Ts'ui-jung et al. (forthcoming). *Asian Population History*. Oxford: Oxford University Press.
- Ma, Xia. 1988. "Changes in Chinese household size and structure," in Xu Dixin (ed.), *Population in Modern China*, pp. 343–374. Beijing: Zhongguo Shehui Kexue Chubanshe.
- McEvedy, Colin and Richard Jones. 1978. *Atlas of World Population History*. Harmondsworth: Penguin Books.
- Rowland, Don T. 1998. "The prevalence of childlessness in cohorts of older women," *Australian Journal on Ageing* 17: 18–23.
- Ruggles, Steven. 1987. *Prolonged Connections: The Rise of the Extended Family in Nineteenth-century England and America*. Madison: University of Wisconsin Press.
- . 1993. "Confessions of a microsimulator," *Historical Methods* 26: 161–169.
- Saito, Osamu. 1996. "Historical demography: Achievements and prospects," *Population Studies* 50: 537–553.
- Schofield, Roger. 1985. "English marriage patterns revisited," *Journal of Family History* 10: 2–19.
- Shi Fengyi. 1987. *Marriage and Family in Chinese History*. Wuhan: Hubei Renmin Chubanshe.
- Skinner, William G. 1997. "Family systems and demographic processes," in David I. Kertzer and Tom Fricke (eds.), *Anthropological Demography: Toward a New Synthesis*, pp. 53–95. Chicago: University of Chicago Press.
- Smith, James E. 1987. "The computer simulation of kin sets and kin counts," in John Bongaarts, Thomas K. Burch, and Kenneth W. Wachter (eds.), *Family Demography: Methods and Their Applications*, pp. 249–266. Oxford: Clarendon Press.
- . 1991. "Aging together, aging alone," in Frederic C. Ludwig (ed.), *Life Span Extension: Consequences and Open Questions*, pp. 81–92. New York: Springer Publishing Company.
- Smith, James E. and Jim Oeppen. 1993. "Estimating numbers of kin in historical England

- using demographic microsimulation," in David S. Reher and Roger Schofield (eds.), *Old and New Methods in Historical Demography*, pp. 281–317. Oxford: Clarendon Press.
- Tang, Deyang and Xie Weihe (eds.). 1993. *The Origin of Chinese Culture*. Jinan: Shandong Renmin Chubanshe.
- Telford, Ted A. 1990. "Patching the holes in Chinese genealogies: Mortality in the lineage populations of Tongcheng county, 1300–1880," *Late Imperial China* 2: 116–137.
- . 1992. "Covariates of men's age at first marriage: The historical demography of Chinese lineages," *Population Studies* 46: 19–35.
- Tu, Edward Jow-Ching, Vicki A. Freedman, and Douglas A. Wolf. 1993. "Kinship and family support in Taiwan: A microsimulation approach," *Research on Aging* 15: 465–486.
- Wachter, Kenneth W. et al. 1978. *Statistical Studies of Historical Social Structure*. New York: Academic Press.
- Wheaton, Robert. 1975. "Family and kinship in Western Europe: The problem of the joint family household," *Journal of Interdisciplinary History* 5: 601–628.
- Wilson, Chris and Pauline Airey. 1999. "How can a homeostatic perspective enhance demographic transition theory?" *Population Studies* 53: 117–128.
- Wolf, Arthur P. 1984. "Family life and the life cycle in rural China," in Robert McC. Netting, Richard R. Wilk, and Eric J. Arnould (eds.), *Households: Comparative and Historical Studies of the Domestic Group*, pp. 279–298. Berkeley: University of California Press.
- . 1985. "Chinese family size: A myth revitalized," in Jin-chang Hsieh and Chuang Ying-chang (eds.), *The Chinese Family and Its Ritual Behaviour*, pp. 30–49. Taipei: The Institute of Ethnology, Academia Sinica.
- Wolf, Arthur P. and Susan B. Hanley. 1985. "Introduction," in Susan B. Hanley and Arthur P. Wolf (eds.), *Family and Population in East Asian History*, pp. 1–12. Stanford: Stanford University Press.
- Wolf, Arthur P. and Chieh-shan Huang. 1980. *Marriage and Adoption in China, 1845–1945*. Stanford: Stanford University Press.
- Wrigley, E. A. 1969. *Population and History*. London: World University Library.
- Wrigley, E. A. et al. 1997. *English Population History from Family Reconstitution 1580–1837*. Cambridge: Cambridge University Press.
- Xia, Wenxin. 1987. "A preliminary study of Chinese household structure," in Liu Ying (ed.), *The Study of Chinese Marriage and Household*, pp. 100–112. Beijing: Shehui Kexue Wenxian Chubanshe.
- Zeng, Yi et al. 1992. "Household composition, its regional variations and trends," in Sun Jingxin et al. (eds.), *China's Contemporary Population*, pp. 302–327. Beijing: State Statistical Bureau.
- Zhao Wenlin and Xie Shujun. 1988. *Population History of China*. Beijing: Beijing Renmin Chubanshe.
- Zhao, Zhongwei. 1988. "Demographic conditions and household composition in Kaiyuan," unpublished manuscript.
- . 1994. "Demographic conditions and multi-generation households in Chinese history: Results from genealogical research and microsimulation," *Population Studies* 48: 413–425.
- . 1996. "The demographic transition in Victorian England and changes in English kinship networks," *Continuity and Change* 11: 243–272.
- . 1997a. "Long-term mortality patterns in Chinese history: Evidence from a recorded clan population," *Population Studies* 51: 117–127.
- . 1997b. "Demographic systems in historic China: Some new findings from recent research," *Journal of the Australian Population Association* 14: 201–232.
- . 1998. "Demographic conditions, microsimulation, and family support for the elderly: Past, present, and future in China," in P. Horden and R. Smith (eds.), *The Locus of Care: Families, Communities, Institutions, and the Provision of Welfare Since Antiquity*, pp. 259–279. London: Routledge.

Uncertain Aims and Tacit Negotiation: Birth Control Practices in Britain, 1925–50

KATE FISHER

IN AN INFLUENTIAL article in 1973, Ansley Coale defined “three general prerequisites” for any society to experience a “major fall in marital fertility.” He claimed first that “Fertility must be within the calculus of conscious choice”; second that “Reduced fertility must...seem an advantage to individual couples”; and third that “Procedures that will in fact prevent births must be known, and there must be sufficient communication between spouses and sufficient sustained will, in both, to employ them successfully.”¹ In the present article I use evidence from detailed oral history interviews to support the claim that these preconditions are not, in fact, necessary to the successful and systematic use of birth control. I aim to show that such models that seek to define and characterize the processes of fertility transition can be misleading and limiting. They do not always clarify the questions to be asked and can constrain investigative research by restricting the types of explanation deemed pertinent or adequate. I contend here that much of the analysis of the increased use of contraception, particularly the demographic literature about “the fertility decline,” is posited on certain assumptions about the nature of family planning choices that do not allow for more subtle understandings of the patterns and processes of contraceptive decisionmaking and the dynamics of conjugal behavior.

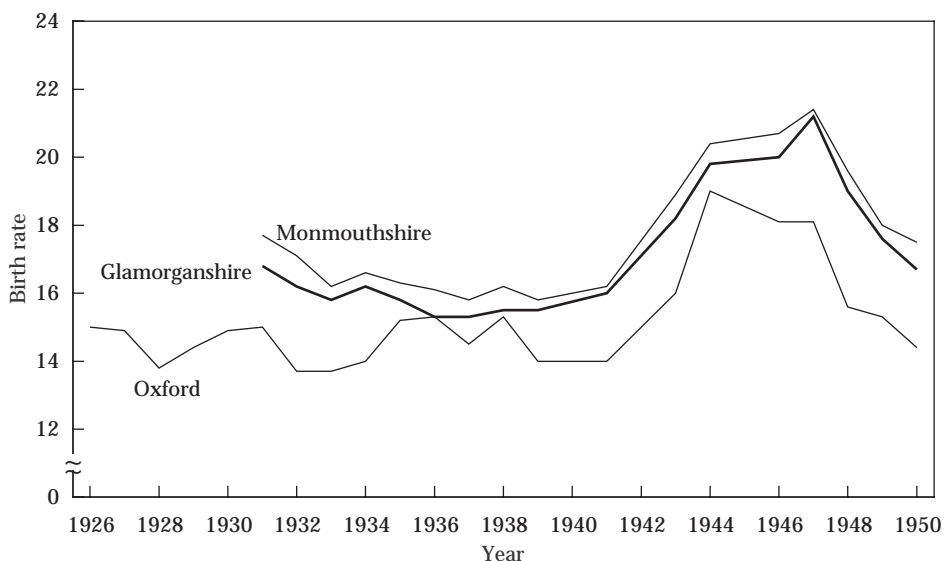
Between 1992 and 1997 I interviewed 107 persons (72 women and 35 men) from working-class districts of Oxford and south Wales. Fifty-nine interviewees came from south Wales (41 women and 18 men) and 48 (31 women and 17 men) from Oxford.² All had been married, though most were now widows or widowers. There were 12 interviews with couples.³ Interviews lasted up to four hours and covered various questions about marriage, family, courtship, sexual attitudes, and, in particular, birth control practices.⁴ Dates of birth ranged from 1899 to 1925 and dates of marriage

from 1918 to 1953. The vast majority (88 percent) were married between 1930 and 1940.⁵ Childless persons (couples) were not part of the sample.

The need for oral history research into birth control behavior has recently been called an “urgent research priority,”⁶ as such detailed qualitative material about individuals’ contraceptive practice is not available from existing sources.⁷ Moreover, recent research has highlighted the regional differences in declining fertility patterns and the importance of local studies.⁸ As David Levine has concluded: “A consensus is emerging that if we want to study the ways in which large-scale social processes are refracted, through the prism of personal experience, into changing strategies of reproduction, then we have to adopt a micro-level mode of analysis.”⁹ The evidence produced below reflects the actions and beliefs of specific communities and social groups in Britain at a particular time span, roughly between 1925 and 1950. Yet there are implications for the supposedly universal models used to analyze declining fertility.

Demographic data reveal a familiar picture of declining fertility in both Oxford and south Wales. Birth rates in Oxford were consistently lower than those in south Wales throughout the period. During and immediately after World War II, marital fertility rose before declining to prewar levels (see Figure 1). The respondents I interviewed revealed similar general trends. In both areas most respondents had three or fewer children. However, ten

FIGURE 1 Crude birth rate per 1,000 population in Oxford, Glamorganshire, and Monmouthshire, 1926–50



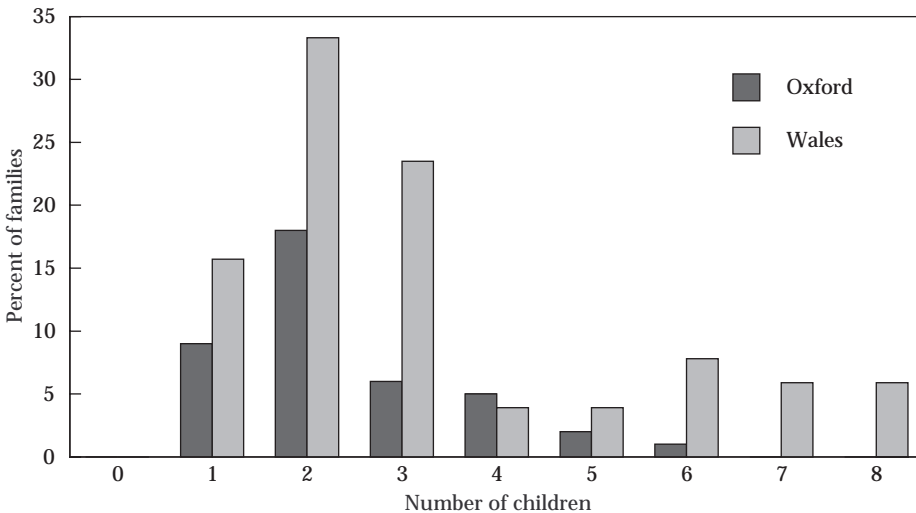
SOURCE: The Registrar General’s Statistical Review of England and Wales (London, HMSO), yearly reports between 1926 and 1950.

Welsh, but only three Oxford, respondents had five or more children.¹⁰ The distributions are shown in Figure 2.

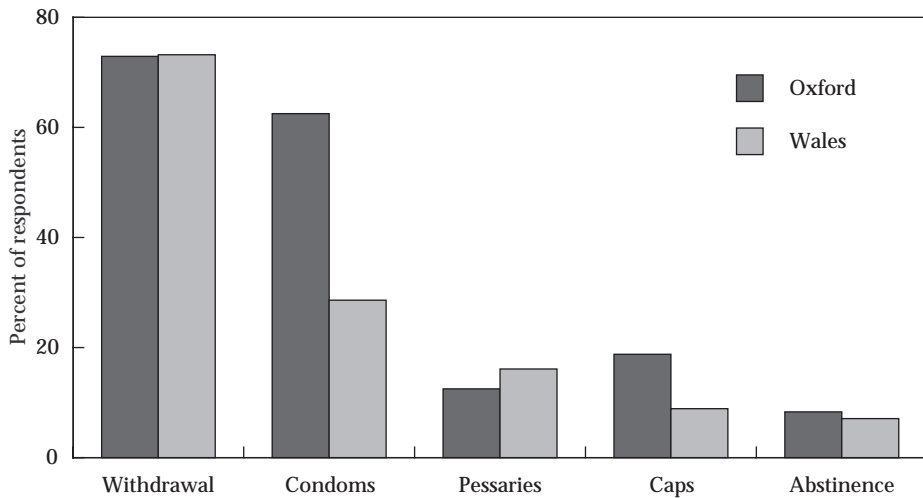
A striking snapshot of the later stages of fertility decline emerges if we compare respondents' own family sizes with the number of children born to their parents. In Oxford the average number of children in respondents' parents' families was five, whereas respondents themselves had, on average, 2.4 children; in the Welsh sample the average number of children in the parental family was seven as opposed to 3.2 among Welsh interviewees themselves. Only 11 percent of Oxford respondents and 11 percent of Welsh respondents had more children than their parents had had. In fact, 36 percent of Welsh respondents and 26 percent of Oxford interviewees were born into families that had between five and 13 more children than they themselves went on to have.

The vast majority of respondents practiced some form of contraception at some point during their marriage.¹¹ Withdrawal and condoms were overwhelmingly the most commonly used methods (see Figure 3). Seventy-six respondents (73 percent) unambiguously reported use of withdrawal, 35 (72 percent) from Oxford and 41 (73 percent) from south Wales.¹² Some interesting differences between Oxford and south Wales emerged.¹³ In south Wales, withdrawal was much more frequently the *only* method used. Twenty-seven withdrawal users (66 percent) in south Wales used withdrawal alone, as compared to 14 (37 percent) such users in Oxford. Sixteen (29

FIGURE 2 Distribution of families by number of children reported in the interview sample



NOTE: Number of families: Oxford 41, Wales 51. The number of families is less than the number of respondents as 12 couples were interviewed. Stillbirths, miscarriages, and infant deaths are not counted.

FIGURE 3 Birth control methods used by respondents

NOTE: Number of respondents in each category: Oxford 48, Wales 56.

percent) Welsh respondents used condoms at some point during their marriage as compared to 30 (62 percent) respondents from Oxford. However, in both Oxford and south Wales withdrawal was the dominant contraceptive practice, and the differences between methods use in Oxford and Wales should not be overemphasized. Although many more people in Oxford tried condoms, those who combined condom use with withdrawal tended to present withdrawal as the more important method. Withdrawal was rarely rejected in favor of condoms. If condoms were used, they tended to play the role of occasional supplement. Very few respondents used female methods or abstinence. Moreover, caps, pessaries, and abstinence, if used, were frequently presented as having been used for the shortest periods of time—adopted late or, more often, rejected early, generally in favor of withdrawal. Nine respondents (five from south Wales and four from Oxford) reported personal experience of induced abortion. None of these respondents used abortion as an alternative to contraception. In each case abortion was only rarely resorted to, usually only once, and almost all of the accounts were of failed abortion attempts.¹⁴

“It was just luck, wasn’t it?”: Birth control use and conscious choices

Coale’s claim that pregnancy and reproduction need to be perceived to lie within the calculus of conscious choice before successful and systematic family limitation can occur has gone virtually unchallenged.¹⁵ He writes: “Po-

tential parents must consider it an acceptable mode of thought and form of behavior to balance advantages and disadvantages before deciding to have another child.”¹⁶ Similarly, the combined emphasis of the articles in the volume edited by Gillis, Tilly, and Levine is on “the degree to which the European fertility decline was the product of conscious choice”;¹⁷ “[e]ach decision to restrict fertility was an act of conscious calculation.”¹⁸ In order to use birth control, it is thereby claimed, parents have to come to a numerical conceptualization of family size and perceive themselves capable of manipulating the timing of births.¹⁹

This image of calculating parents bears little relation to the everyday dynamics of family decisionmaking. Oral testimony suggests that such a calculative attitude toward childbearing was not always central to respondents’ approaches to family limitation. Rather, a number of respondents placed considerable stress on the unpredictability of family size and pregnancy, emphasizing the casual, ill-informed, ill-considered way in which they approached family building. Above all, the vast majority of respondents denied that they were in a position to “plan” their families.

Millie, for example, emphasized that she did not have a fixed or clear idea about how many children she wanted and did not have any strong intentions with regard to spacing:

So, you didn't want a large family like the one you'd grown up in?²⁰

Well, no, phrr! One didn't avoid, avoid it. I mean, I thought I would have, as I came from a big family, but we didn't, any of us, have a lot of children, you see. The most was three, no, oh, one of my sisters did have five. Yes, that's right.

So did you plan to have those big gaps?

No, no, it just happened. No, I mean, didn't do anything to prevent it or anything. Just the way it went.

Did you talk to your husband about when to have children and whether to have children?

No. No, we never bothered, either of us. 'Cos we were fond of children, always have been. So, it didn't worry us. I don't think I would have wanted a big family though, none the more for that. Because, had he had a better job I might have done, or, but er, I found it enough to keep three children on what he was earning.

Hmm. So did you ever do anything to try to not get pregnant?

No [quizzically]. Well, took, er, yes, precautions, themselves, yes, but I didn't.

What did he take?

Well, I suppose you, wearing something I suppose, more or less, yes, that was it. Yes, I suppose that's what it was.

Only four respondents said that they “planned” their families. In contrast, 31 people explicitly claimed never to have thought about any aspect of family size or birth control at any stage before or during their marriages. Birth control was used, but only with the general hope that family size would then be kept down, rather than to ensure a particular timing or spacing of births.²¹ Moreover, even those few who did make such decisions about when to start a family were adamant that “planning” was not an appropriate term to describe their behavior. Jack “decided we’d like a family” but did not plan, “not as the word mean, plan, no, I mean, we tried to have a child and then, well the family just happened, you know, just happened along.” Almost all respondents, therefore, highlighted the lack of control they felt they had over their family size.

Many respondents pointed to their partial knowledge of birth control methods and the fallibility of the methods they adopted. Nancy “didn’t have any advice” and relied on withdrawal, which she felt was taking “a chance.” In such circumstances family size was not something she felt she could predict: “You just had to sort of um, trust to luck, really. I mean, I could have had a big family.”

We need to accept that there are new ways of understanding the mentality necessary for successful contraceptive use.²² The decline in fertility does not necessarily reflect the adoption of “a more calculating attitude about childbearing,” and the historian’s task is not therefore the explanation of “a cultural revolution that erodes...fatalist passivity...and brings the possibility of preventive action within the realm of conscious choice.”²³

In fact, some oral testimony was strikingly similar to the evidence used by advocates of the calculus of conscious choice theory to illustrate the “un-thinkability” of fertility control in some past and present cultures. Etienne van de Walle quotes the following example of a pretransition society in which women “lack the frame of mind and the clear numerical standard that would allow them to make sense of small families and the means to obtain them.” A mother of ten children says, “We wait...we don’t know at what time the child comes.... What time there must be between one child and the next, one does not know...God only knows it.”²⁴ Very similar is the testimony of Reene, who used withdrawal and had six children:

Things just happen....What I say is, what’s for you, you’ll have. If I wasn’t to have six, I wouldn’t have had six.

Another example is provided by Florence’s testimony. She had only one child, but her language when describing the methods of family limitation she and her husband used was fatalistic, emphasizing the inability to exercise control over family size²⁵:

We never used to discuss it. My mother used to say what will be will be and you won't stop it. That was the way she advised us to look at life.... I was never interested because I used to think, what's for you you will have and you have to make the best of your life. You used to, see years ago five, six, or seven was nothing in families.

Some respondents represented themselves in ways similar to those living in what historians call the pretransition period, who are held to be incapable of controlling the size of their families. Yet, by the evidence of their fertility, these British respondents clearly used birth control to a much greater extent than most people living in pretransition societies and to a much greater extent than their parents. It would appear, therefore, that a significant change in mass birth control behavior did not necessarily require a revolutionary shift in mentality.

“We didn't really mind having the kids”: Birth control use and family-building strategies

Coale's second claim is that in order to practice birth control successfully, parents must have sufficient and pressing reasons for doing so: reduced fertility must be advantageous and perceived to be so by individual couples. Such a formulation leads to a model that presents couples as rationally weighing the pros and cons of childbearing. This perception of the reasoning behind contraceptive behavior is simplistic and distorts our understanding of the process of and impulses behind changes in contraceptive practice. The argument “supposes households or individuals within households had a determinant and determinable set of preferences for children, which they rationally assessed so as to produce optimal outcomes.”²⁶

The majority of respondents clearly denied making the sorts of rational calculations envisaged by most historians and demographers. They used birth control without formulating an ideal family size and without carefully assessing either the benefits or the disadvantages of childbearing at any particular time. They used birth control, yet they claimed not to mind when children were born or to care how many they had.

The unplanned nature of contraceptive strategies presented by respondents should be interpreted as revealing the complexities in birth control behavior commonly neglected by students of the fertility transition. Rational choice models are frequently based on polarized and simplistic notions of intent and behavior. For example, couples are often perceived as either completely indifferent to the possibility of pregnancy or determined to avoid it and are therefore thought either to have done nothing at all to limit births or to have used birth control with deliberate consistency. We should in-

stead acknowledge that a couple using birth control may have had strong or weak reasons for avoiding pregnancy and that the strength of motivation with regard to future pregnancy will have had an impact on the contraceptive behavior adopted—both the method chosen and the conscientiousness with which it was employed.

Birth control use did not always result from a firm decision to avoid having another child. As Louisa revealed:

No, there wasn't a time I didn't want to be pregnant, not in my mind, I just, we were just careful and if there was anything to do with sex my, my husband used, as they called them then, a French letter, if we wanted sex, we were careful that way.

Respondents had various reasons for using birth control. In a substantial number of instances, respondents presented themselves as acting, unthinkingly, in accordance with common practice. Withdrawal, in particular, was so much an accepted, normal aspect of sexual activity that it could be practiced without active or strong contraceptive aims. Many other respondents had difficulty articulating the reasons behind their contraceptive behavior. They predominately represented their desires about family size as having had indeterminate and imperceptible influences. Some talked about poverty, aspirations for certain lifestyles, models of family life and marriage, and ambitions for raising their children, but all of this only in the abstract. A number of women mentioned desiring to avoid the large families they grew up in, while others wanted to avoid the pain of labor. Such reasons, however, were presented by the majority as vague, post hoc rationalizations, rather than as thoughts and deliberations that preceded determined decisions to avoid pregnancy.

The motivation behind birth control use was also likely to change during the course of a marriage. Studies of fertility decline rarely examine the patterns of contraceptive behavior beyond the simplistic notion that couples either used birth control constantly throughout marriage or did not use birth control until the ideal family size had been reached (the spacing versus stopping question).²⁷ Hilda, for example, illustrated the ways in which, for many, contraceptive strategies and the determination with which birth control was employed were likely to change over the course of a couple's childbearing years. For the first years of her marriage she and her husband used condoms "sometimes, not very often," as they were not anxious to avoid pregnancy: "We never decided on anything...never bothered about it. If we'd had more, we'd have had more." After her second child was born, however, the couple switched to using withdrawal all the time. Hilda's motivation to avoid pregnancy was significantly increased after her doctor told her

“it wasn’t advisable to have another...’cos if I had any more children I’d still have the same trouble, and, I mean, that’s no joke.”²⁸

Similarly, Ann had a casual attitude toward family size at the beginning of her marriage:

You had a four-year gap before your son and the daughter.... Did you plan that gap?
No, just happened...we didn’t plan, we didn’t plan anything, it just happened, sort of thing, people didn’t them days, I don’t think. If they got pregnant, they got pregnant.

When her daughter died soon after birth, however, Ann’s attitude changed: “I wanted one to replace the one that we lost.” And after the next pregnancy she and her husband resolved not to have any more: “Oh, I told him, I said, ‘I’m not having no more,’ I’d had enough and I had a very bad time on the one.”

Different motivations for avoiding pregnancy thus affected the extent to which couples used birth control during sexual activity. It is essential that our models of fertility behavior make allowance for the possibility of sporadic or indifferent use of birth control. Many respondents, such as Phyllis below, acknowledged that the determination and conscientiousness with which they used birth control was far from perfect, precisely because they had an easygoing attitude toward the exact number and spacing of their children:

So you had a smaller family than the family you grew up in?

Oh yeah, only two. Dunno why I didn’t, because I wouldn’t’ve minded more children, but it just didn’t happen...we didn’t take any precautions, ’cos we didn’t know anything in them days, just had what came. No, we didn’t, I mean, we just took it, just took it as it came. If we had them, we should’ve had them, and that was it...you just gotta trust them not finish properly then. Just get away before the seed starts, that’s something I’d heard....

And did you ever do that?

...I think we must have done...but I don’t think that was why I didn’t have any more, it wasn’t ever—you know, not every time.

It is not easy to quantify on the basis of oral history interviews the conscientiousness with which respondents used birth control, especially given that such patterns were likely to change during the course of a marriage. It is, however, worth summarizing the details of comments by some interviewees who clearly and explicitly analyzed the patterns of their contraceptive use. Thirteen respondents represented their birth control use as regular and consistent (except when pregnancy was desired). Twenty-four used contraception reasonably conscientiously but pointed out that their

use was imperfect. Twelve stated that they frequently neglected to use birth control. Five claimed to have rarely employed any techniques of family limitation. Twelve represented the conscientiousness with which they employed birth control as having increased during their marriage, and five spoke of a decline in the degree to which they regularly used contraception.²⁹

The complexities of contraceptive strategies are rarely recognized in historical treatments or in sociological studies of contraceptive behavior. Ernest Lewis-Faning's study of family limitation for the Royal Commission on Population, for instance, simply examined how many children were or were not "wanted" and how many were or were not "planned." It treated an unplanned child as one that resulted from "any pregnancy which occurred despite the use of birth control" and an "unwanted" child as one "born after the family was as large as the mother wished it to be."³⁰ Myra Woolf's questions on family intentions were also based on strict notions of "planned pregnancies." These inquiries did not allow for the multifaceted ways in which couples' intentions regarding pregnancy and family size were actually formulated, nor for the possibility of a more elaborate relationship between intentions and contraceptive behavior. Woolf simply categorized respondents as having planned or not planned their pregnancies and as having "used contraception" or not.³¹ Ann Cartwright was aware of the "major difficulties" faced by those conducting social surveys about intentions toward family size and contraceptive planning: "asking people questions about their intentions may seem to imply that they should have plans.... [A]nother problem is the wide variety in the possible nature of people's intentions.... A third difficulty is that people may have feelings and intentions which are apparently inconsistent." She found that "a substantial proportion of couples do not have definite intentions...about the number of children they want" and that more than 48 percent of pregnancies were either "unintended, accidental, initially regretted, or wrongly spaced."³² However, Cartwright does not examine the relationship between general desires and birth control practices or admit the possibility of irregular birth control use.³³

Close examination of relevant sociological material, however, reveals further evidence for the existence of such complex family planning strategies. Slater and Woodside's research in the mid-1940s presented contraception as "carried out spasmodically and with a great deal of carelessness." They argued that "parents rarely carry out a consistent plan. Contraception is haphazard, as if the parents did not know clearly what they did want, or were too lazy, indifferent or incompetent to carry out their wishes effectively."³⁴ Brett Harvey, who studied the recollections of American women married during the 1950s, was "surprised by how many of the women I interviewed seem to 'drift' into motherhood, rather than *deciding* to get pregnant."³⁵ Ralph LaRossa, in a 1977 study, was taken aback by the casual attitude to pregnancy presented by some of his respondents. He interviewed a couple expecting their

first child who did not view the decision to have a child as a “major decision in their lives.” The couple “went so far as to say that they felt they had put more thought into when to get their cat than they did into when to have a child. When I asked whether they had planned the pregnancy, I was first given the impression that they had used something of a *laissez-faire* approach (if it happens, it happens).”³⁶ Joan Busfield and Michael Paddon’s study is one of the few to appreciate the complexity of contraceptive decisions, to understand that couples do not always make firm choices, and to realize that aims and intentions regarding family size are constantly in flux and negotiation. Their main criticism of historical and contemporary explanations of variations in childbearing both in the West and in developing countries is “their failure to take proper cognisance of the nature and complexity of human action.”³⁷

To sum up, for a great many of those interviewed the use of contraception did not reflect the adoption of a firm and constant strategy for family planning.³⁸ The research I present here found that the majority of couples interviewed did not perceive themselves as having been in a position to “plan” their families. First, they saw their contraceptive options as limited, their knowledge as incomplete or unsatisfactory, and the available methods as untrustworthy. Second, they had no firm plans or desires with regard to family size. They did not have strong opinions about the spacing of their children nor clear intentions as to an ideal number to be born. These couples used contraception with varying degrees of consistency, in the knowledge that such behavior would be likely to fulfill their modest and realistic desires with regard to family size. Such contraceptive behavior rarely needed reevaluating. When pregnancy did occur, most couples did not categorize the event as a “contraceptive failure.” They expected and did not object to the occasional pregnancy. Their contraceptive behavior illustrates the practice resulting from a vague goal to delay the next birth or to have fewer or no more children—a goal that might emerge at any stage of marriage and that was not necessarily maintained.

It is essential that such unformulated attitudes toward the timing of pregnancy, size of family, and use of contraceptive strategies be acknowledged and incorporated into studies of fertility decline. Models based on parents’ weighing the costs and benefits of childbearing are discordant and inappropriate ways to describe the actions of and rationale behind much of the contraceptive behavior and decisionmaking as presented by respondents. Moreover, the dominance of this misleading image drives the search for explanations of contraceptive behavior and influences the possible factors that can be envisaged as having sufficient explanatory power. Of course, use of the language of planning, calculation, and conscious choice does not necessarily indicate that historians fail to recognize that, in practice, fertility decisions were a great deal more complex and uncertain. However, the

prevalence of such formulations tends to proscribe the acceptability of more-complex explanations. Modifying our perceptions of the decisionmaking dynamics involved in contraceptive use transforms the way we approach the explanation of such changes in fertility behavior.

“It was an unspoken thing”: Birth control use and conjugal communication

Central also to current understandings of birth control practice in the historiographical literature, especially works that seek to explain the fertility decline, is a certain perception of communication between spouses. The last of Coale’s three preconditions stresses the importance of sufficient communication between spouses. It is usually assumed that consensus is reached and acted upon only after detailed discussion and consideration of whether and when to have another child and which method of contraception to use in the meantime. Evidence for a systematic reduction of family size is thus perceived as evidence of calculated action on the part of parents, which, in turn, is presented as probable evidence for communication between spouses about childbearing. Diana Gittins and Elizabeth Roberts both concurred that an important factor in limiting families was the ability of husband and wife to discuss the question.³⁹

The only alternative so far conceived to this perception of explicit spousal communication is one in which one partner practices birth control without the knowledge of the other spouse. Simon Szreter argues that abstinence might have been adopted unilaterally by the husband without the wife understanding his contraceptive purpose, whereas withdrawal and appliance methods “would have also required an adequate communicative relationship between the spouses.”⁴⁰ Birth control clinics frequently promoted the female cap as a method that could be used without the husband’s knowledge or cooperation. The historical literature tends to focus on dichotomous distinctions between the highly communicative couple and the separate, silent couple; between those who acted unilaterally and those who acted in total agreement; between those who acted clandestinely and those who acted after full discussion. The approach I am suggesting draws a more nuanced picture of negotiation between spouses about birth control and highlights the various types of communication that accompanied the adoption of birth control practices.

Many respondents stressed the limited nature of explicit discussion of family planning aims and contraception. Annie, for example, reported that her husband started using condoms from the beginning of their marriage and did so consistently throughout. She and her husband quickly realized that “they didn’t want children” and thus did not need to discuss the matter during their marriage. Even when the method failed (eventually they

had two children) they did not reappraise their contraceptive practice. Annie had almost nothing to say each time I asked her about discussing either family size or contraception.

So tell me...did you talk to your husband, when you didn't want any children? Did you talk about having children with your husband?

Well, we didn't really. He just, I just, we just thought we didn't want any. That was all! Wasn't much....

So tell me about the discussions you had with your husband about not wanting to have children.

Well, I don't know anything. It just come automatic. I didn't want, he didn't want any, and that was it. We never bothered talking about it....

And you talked to your husband about using condoms? Can you remember?

No, he just used them and that was it. But, neither of us wanted any more children.

Many of those interviewed seem to have reached an easy consensus with their spouse about aims and desires with regard to family size, leaving little need for in-depth discussion. Birth control behavior was not necessarily accompanied by explicit negotiation; it was simply assumed without direct articulation that sexual activity would, at least some of the time, be accompanied by use of contraception. These findings are consistent with those of Busfield and Paddon, who have challenged the assumption that "discussion is always necessary or valuable in contraceptive use; not only may husbands and wives come to agree without directly discussing the matter, but discussion may even be counterproductive, entrenching positions and increasing conflict and hostility. Moreover, when and if agreement is reached on a particular subject, discussion may be infrequent, yet this cannot be taken as a sign of poor communication or disagreement."⁴¹

Janet Finch and Jennifer Mason's analysis of familial roles with regard to family responsibility, such as the care of elderly parents, posits a type of negotiation they term "non-decisions." They explain: "By this we mean the process of reaching an understanding about family responsibilities without *either* open discussion *or* any party having formed a clear intention [to do so] as far as we can tell.... [I]t represents the spectrum where negotiations are most[ly] implicit.... In very many cases when people talk about how they (or someone else) came to accept responsibility for helping a particular relative, they cannot reconstruct a consciously formulated strategy, or identify a point in time when there was an overt agreement. The arrangement just emerged."⁴² This concept of non-decisions is useful in understanding the adoption of birth control in many of the families I interviewed. For many couples a tacit understanding emerged that birth control would be

used at certain times during the marriage. It was simply understood that too large a family was undesirable and that certain steps would have to be taken.

Hetty is an appropriate example. At the beginning of her marriage she and her husband had certain shared aspirations with regard to family size and so did not discuss the matter. An easily-reached consensus, coupled with a casual attitude to the particular timing of births, meant that in-depth discussion was unnecessary:

Well tell me about the sorts of discussions you had with your husband about having children, you certainly, when you first got married you decided to...

I don't think we had, we didn't have much of a discussion. We didn't want to start a family straight away, especially when we were going to live in Scotland, until we knew what we were going to do and then of course the war came up and his job folded, but we had just before that sort of decided that we would start a family, but um you'd have to know my husband to realise the attitude he would take, it was a case of um, well I'd like to have a baby, we'll have a baby sometime and a er, girl for me, a little boy for you and er there was no proper, no in-depth discussion about it, it was a case with him, well if it happened it would be jolly good, you know, I'll be very pleased, and if it didn't, well it didn't. And that was all.

The minority of respondents who did report explicit discussion about birth control behavior generally represented such debate as having been the result of a crisis or dispute. Some couples held conflicting ideas about contraception, which they openly argued about.⁴³ Some discussed family limitation explicitly if their determination to use birth control increased, for example, after an unexpected pregnancy or after a difficult or dangerous birth. What distinguishes Doris from the majority who did not regularly or explicitly discuss family planning was the fact that she and her husband had opposing desires:

So tell me about the discussions you would have with your husband about whether to have children and when to have children.

Oh dear, that caused animosity [laughs].

Really? Oh, tell me.

He wanted children, and I didn't. I had such a bad time on Pat, first one, that it put me off children altogether. You know, I had to have instruments and um, although I had a baby at home, the doctor, I had two doctors there and they put me under and delivered her, sort of thing, you know. I thought, after that, "no thanks I'm not having more children."

So did you used to have arguments when you didn't want children?

Oh, no, no, we didn't argue, we just, um, he was very docile sort of man, quiet and um, although he loved children, he respected my wishes, I suppose, and in

the end I thought, “oh well it’s not fair I’d better give in,” kind of thing, so there we are.

My interviews highlight the need to explore in greater depth the subtle and intricate ways in which couples make decisions and communicate with each other. They demonstrate that couples might reach an understanding about birth control aims and strategies through incremental and implicit forms of negotiation. They contradict the simplistic assumption that using contraception requires the rational evaluation of the costs of childrearing and the notion that overt, consensual, and in-depth discussion of family planning is necessary for successful use of birth control. Contraceptive use, the interviews show, did not generally involve planning or clear decisions made before the birth of each child. Birth control practice was much more likely to have been the result of elaborate processes in which roles, responsibilities, expectations, and commitments emerged gradually, incrementally, and almost unnoticed.

“It’s more to do with the male”: Gender-based roles and contraceptive decisionmaking

Gender-based roles are also crucial to understanding the implicit communication of birth control practices and family planning aims depicted by respondents. One of the reasons direct discussion is thought to be essential to the successful use of contraception is the dominant assumption that the drive to use birth control was led primarily by women. John Caldwell, for example, argues that common to “all fertility transitions” is “women’s increased ability to determine their own fertility.”⁴⁴ Models that envisage women persuading husbands to practice contraception are also likely to stress the importance of discussion about contraceptive behavior between couples. A substantial number of interviewees, however, did not talk about birth control with their spouses because it was in fact the husbands who initiated and controlled fertility-limitation strategies.⁴⁵

Oral testimony frequently emphasized the husband’s role. The most common representation of the decisionmaking process connected the lack of discussion with the expectation that some sort of action would be taken by the husband. Louisa’s husband, for example, procured condoms: “We didn’t do much talking...he used to get them and I used to rely on him that he got them.” In many households, the paucity of discussion regarding birth control reflected the simple expectation that men would act.⁴⁶ Thus, Ernest remarked:

We took the responsibility of seeing that there were no conceptions, unwanted. It was the man, it was the man’s job....

So did you talk to your wife about using French letters and...?

Oh no, no, no, it wasn't discussed as such it was just accepted, yeah...it was an unspoken thing, you see, you just accepted it, oh yes, yes, yes, no, and there was no secrets as far as you could call them secrets, there were no secrets between man and wife, it was just the accepted thing.

Oral interviews with women in the United States about their experiences in the 1920s and 1930s reveal similar expectations of male action: "I would never do that [induce abortion], that's my husband, it's the man who takes care."⁴⁷ Such findings stand in stark opposition to the argument that successful contraception is necessarily accompanied by discussion between spouses. Research into contraceptive behavior conducted in Puerto Rico in the early 1950s concluded that "communication between partners would seem necessary to ensure effective birth control practice."⁴⁸ Yet such research also found a significant group of couples in which husbands believed that "the sphere of family planning is their prerogative alone": "For some men, the idea that the wife's view should be taken into consideration on the matter of family planning would seem radical. As expressed by one 'lower-class' male: 'I am the one who uses birth control. She doesn't know the secret. The woman gets pregnant when the man wants her to.'"⁴⁹

A further reason why respondents emphasized both the lack of discussion that accompanied the adoption of contraceptive strategies and male roles in birth control use is revealed if we recognize the sexual component of fertility decisions. First, deciding to use birth control was never an abstract family planning decision based solely on aspirations with regard to children. It was inevitably affected by the nature of sexual relations within marriage. Discussions about contraception were also negotiations about the terms and conditions of sex. Second, contraceptive decisions were made at various times and contexts, and one such context for decisionmaking was during sex. The dynamics of birth control choices made at such moments are crucial to our understanding of family planning strategies and practices.

The sexual associations of birth control provide more evidence for the contentions that couples frequently avoided explicit discussion of family planning strategies and that husbands dominated contraceptive behavior. Many interviewees asserted that discussion of contraception was avoided because it meant talking about sex. According to Jack:

The, um, taking precautions was just left to me to do. You know, she was quite satisfied with the arrangements I made.

Why was that, why was it your...?

I don't remember talking much about sex, not in a, not in a, might be a bit spicy way, but, no don't remember talking much about it, didn't discuss it much I, don't think we did, no. As I say it was left mostly to me to make the decisions on, in that situation.

Many women revealed that taking a dominant role in contraceptive use was difficult because it meant playing a proactive sexual role they were unaccustomed to. Interviewees suggested that men generally took the lead in using contraception because they were the usual initiators of sexual activity. A domestic ideology that left the timing of sex up to the husband also made it more likely that he would play the active role in deciding whether or not to use contraception.⁵⁰ Edith left it to her husband to “do the controlling” precisely because “I never used to...like they do today the girls, they take over...but we didn’t, we just laid back and thought of England, like as they call it...We didn’t make any advances...your husband did all the advance making.”

Since men played the dominant role and since condoms and withdrawal were the main methods used, the husband frequently had to make a further, often unilateral, decision. Alfie indicated that during each sexual act he had to choose whether or not to use birth control: “You can feel it coming, and you’ve got to make up your mind whether you withdraw or let it go.”

Much of the contemporary demographic and sociological literature assumes that women took charge of birth control behavior both because they were “responsible for most aspects of domestic life”⁵¹ and because they “had more reason than men to be concerned with the consequences of childbearing”⁵² and so were “more anxious than men to limit family size.”⁵³ This assumption ignores the full complexity of contraceptive decisionmaking and, specifically, the fact that birth control negotiations and responsibilities for family limitation were just as much about the negotiation of sexual roles and responsibility for sexual behavior as about responsibility for family issues. While women may have been concerned with the everyday practicalities of childbearing and childrearing, men were generally responsible for the timing and nature of sexual activity and for the decision whether to use contraception. While “most men” may indeed have “deferred to their wife’s decision-making in domestic matters,” they retained prime authority in the sexual arena.⁵⁴ As Busfield and Paddon have recognized, it is important to define contraceptive use as a sexual matter as well as an issue associated with family and children. They argued that “being responsible for birth control is more likely to be regarded as a matter for the husband than that of deciding family size and spacing, since it is often seen as one aspect of the sexual sphere in which the man is expected to take the initiative. We had the impression that for the wife to be held to have the main responsibility for birth control the issue has to be defined more as one of having children, than of sex.”⁵⁵ My interviews fully support the validity of this interpretation.

Gender roles and the sexual dynamics of birth control negotiations draw attention to the simplifications inherent in many models of fertility decline. As has been increasingly recognized, changes in fertility behavior need to be studied alongside changes in sexual attitudes and gender rela-

tions. Wally Seccombe has written: "Sexual desire and conjugal power are absent from the mainstream paradigms of fertility regulation: it is as if demographers believed in the Immaculate Conception—for everyone."⁵⁶ The perception that direct spousal evaluation of the costs and benefits of child-bearing and explicit discussion of birth control options are necessary conditions before birth control can be successfully used ignores the fact that such debates were affected by the nature of sexual relations within marriage. Many couples interviewed reported they had found it difficult to talk about sex with their spouse. Such difficulties extended to the articulation of desires with regard to birth control use and fostered a culture that placed men in a pivotal position regarding contraceptive strategy.

The obvious question raised by the use made of oral testimony is whether the inarticulate, hesitant, and indecisive accounts of family planning choices reveal more about the problems of oral history than about the dynamics of birth control practices. First, it is not implausible that the details of discussion, calculation, and planning had simply been forgotten during the 50 or so years between their occurrence and the interview. However, respondents did not state simply that they could not recall any discussion, planning, or decisionmaking but emphatically insisted that there was none. Moreover, even if some discussions had indeed taken place that have subsequently been forgotten, the very fact that they were not remembered suggests these negotiations were rare or were discussed implicitly rather than explicitly. Second, embarrassment during the interview might account for the difficulty respondents had in articulating the details of contraceptive choices. In fact, however, the tenor of the interviews was unexpectedly frank and open. Respondents were, on the whole, remarkably forthcoming with personal details of sexual attitudes and practices. Moreover, the existence of some embarrassment and especially the clear evidence of inarticulacy when describing sexual matters underscore the validity of my claim that respondents were not accustomed to detailed discussion of sexual and contraceptive issues—neither now nor in the past.

Conclusions

Dominant in much of the contemporary historiography of contraceptive behavior are particular conceptualizations of the rationality, thought processes, and conjugal negotiations behind successful family planning. This article has sought to demonstrate the inadequacies of these models in capturing the complexity of birth control practice, the diversity of contraceptive strategies, and the intricacies of family planning negotiations. Many models of fertility decline rest upon a dichotomous portrayal in which past societies are presented as passive and fatalistic in their approach to family size while post-transitional societies are seen as inhabited by newly calculating indi-

viduals. As I have shown, however, contraceptive decisions should not be conceived along polarized lines as either rational or irrational, discussed or unmentioned, calculated or random. Family building was not either planned or unplanned, births were not either accidental or wanted.

My central finding is that oral respondents in two areas of Britain, in sharp contrast with the prevalent image of contraceptive users in the contemporary demographic and historical literature, emphatically presented their contraceptive behavior as ill-thought-out, barely discussed, haphazard actions that could not be relied upon to prevent pregnancy. They did not plan their families. They were not determined to have a certain number of children at a certain time. They adopted contraception frequently enough that their vague plans did not result in a family size or spacing of children that was too inconvenient or unmanageable. They did not make firm decisions, and most couples adopted family planning strategies without explicit discussion or communication. Predominantly, male methods were used, and most women left the specific choices of when to use birth control to their husbands, who were largely left in charge of sexual matters. Contraceptive responsibilities, which ensured that birth control was used with a certain degree of consistency, emerged gradually without overt discussions of aims and plans.

Henry summarized the rationale behind many couples' contraceptive behavior. He claimed he wanted a small family, but that he "never really planned." He was prepared to accept "whatever his family size turned out to be." His use of condoms and withdrawal was merely to keep his family's size "in perspective":

No we just took things as we went, I think, both of us, never really planned anything, whatever was to come, we accepted it...make your life around whatever your family turns out to be, that's the way Dee and I have taken it on....

But...you were using contraceptives...?

Oh, well, I suppose, yes, yes, you were er trying, like, not to...have as many as you can in that sense of it, you were trying to keep it in its right perspective....

Accounts of the extensive changes in fertility behavior during the early twentieth century should recognize the complex forms of behavior and motivation presented here. If we simply see family planning decisions as conscious calculations to be contrasted with a fatalistic passivity toward pregnancy exhibited by former generations, we proscribe the types of explanations that are plausible. Clear social or economic reasons for limiting family size were not always at the forefront of respondents' minds. While birth control use was seen as economically expedient, a great deal of uncertainty surrounded respondents' family-size choices, as did a casual irresolu-

tion in their attitude toward childbearing. Nevertheless, in this vague and indecisive way contraception was used, and it was efficient enough to significantly reduce the frequency with which pregnancy occurred. As a result, low fertility was effectively achieved.

Notes

The research was conducted as part of an Oxford D.Phil funded by the Wellcome Trust. See Kate Fisher, "An oral history of birth control practice c. 1925–50: A study of Oxford and South Wales," unpublished D.Phil Thesis, Oxford University, 1997.

1 Ansley J. Coale, "The demographic transition," *International Population Conference, Liège 1973*, Vol. 1 (Liège: IUSSP, 1973), p. 65.

2 The majority of Welsh interviewees came from the mining towns and villages of the south Wales "valleys." Twenty-five were miners or wives of miners. The majority of Oxford respondents worked in the burgeoning automobile industry. All respondents had low educational attainment and began their working lives in unskilled or semiskilled occupations.

3 Couples were frequently interviewed separately and then together, but this was not always the case. Some preferred to stay together, and sometimes limitations of physical space made it unreasonable to demand individual interviews with each partner. In such cases, however, longer, more in-depth discussions were possible. Interviewing couples together can be a more productive form of discussion than the standard separation approach. Two additional interviewees were also married; their spouse chose to come in and out of the interview and contribute only occasionally.

4 Interviewees were found and approached in old age people's homes, local authority day centers, and social clubs (working-men's institutes, bingo halls, works associations, and so on). Interviewees were asked whether they would be prepared to be interviewed about all aspects of their married lives. Birth control and sex were specifically mentioned only if further information about the interview agenda was demanded. During the interviews, therefore, caution had to be taken, as consent to discuss sexual matters had

not necessarily been granted by the respondent at the point of agreeing to be interviewed. Very few of those approached did not want to be interviewed, and most were willing to discuss birth control openly, albeit frequently in hesitant and euphemistic ways. All interviews were conducted in English and in private (generally a respondent's own home). All interviews were tape recorded and transcribed. The majority of respondents have granted permission for the recordings to be deposited in the British Library National Sound Archive. Respondents were guaranteed anonymity, hence names have been changed in the discussion that follows.

5 Median date of birth was 1913 and median year of marriage was 1934.

6 Simon Szreter, *Fertility, Class and Gender in Britain, 1860–1940* (Cambridge: Cambridge University Press, 1996), p. 579.

7 Some very limited information on individual practices in Great Britain is available. The main inquiry into contraceptive practice was undertaken by Ernest Lewis-Faning, *Report of an Enquiry into Family Limitation and Its Influence on Human Fertility During the Past Fifty Years* (London: HMSO, 1949). Also important is a survey undertaken for the Population Investigation Committee by Griselda Rowntree and Rachel M. Pierce. See Griselda Rowntree and Rachel M. Pierce, "Birth control in Britain, part I," *Population Studies* 15 (1961): 3–31 and Rachel M. Pierce and Griselda Rowntree, "Birth control in Britain, part II," *Population Studies* 15 (1961): 121–160. The findings of such surveys are usefully summarized in C. M. Langford, "Birth control practice in Great Britain: A review of the evidence from cross-sectional surveys," in *Population Studies* 45 Supp (1991): 49–68. See also the correspondence of Marie Stopes held at the British Library and at the Contemporary Medical Archives Centre of the Wellcome Institute for the History of Medi-

cine, as analyzed, for instance, by Wally Secombe, *Weathering the Storm: Working-Class Families from the Industrial Revolution to the Fertility Decline* (London and New York: Verso, 1993); Clare Davey, "Birth control in Britain during the inter-war years: Evidence from the Stopes correspondence," *Journal of Family History* 13 (1988): 329–345; Evelyn Faulkner, "'Powerless to prevent him': Attitudes of married working-class women in the 1920s and the rise of sexual power," *Local Population Studies* 49 (1992): 51–61.

8 Most completely by Szyreter, *Fertility, Class and Gender*, cited in note 6.

9 David Levine, Review of Michael S. Teitelbaum, *The British Fertility Decline: Demographic Transition in the Crucible of the Industrial Revolution*, in *Journal of Social History* 19 (1986): 720.

10 None of the figures presented should be seen as statistically revealing. The sample size is relatively small and the interview procedure was designed to obtain material in a qualitative rather than a quantitative format. Nevertheless, reporting the numbers involved provides useful information about the content of interview material.

11 Twelve respondents did not provide clear and unequivocal evidence of specific contraceptive practices; however, in several of these cases there were ambiguous hints that withdrawal was used.

12 This number is probably an underestimate; see note 11.

13 I do not specifically address the reasons for differential fertility in Oxford and south Wales, but instead explore the various family planning strategies presented by interviewees.

14 See Kate Fisher, "'Didn't stop to think, I just didn't want another one': The culture of abortion in interwar south Wales," in F. Eder, L. A. Hall, and G. Hekma (eds.), *Sexual Cultures in Europe: Themes in Sexuality* (Manchester and New York: Manchester University Press, 1999), pp. 213–232. In this article the terms birth control and contraception are used synonymously to refer to all types of fertility control (including withdrawal), despite the fact that birth control encompasses abortion and contraception does not. It is respondents' approaches to family limitation as a whole that are primarily at

issue, and the majority of practices revealed were contraceptive. It should also be noted that during interviews great care was taken in the use of terms, as many respondents did not view withdrawal as a form of birth control.

15 The influence of this criterion is explored in George Alter, "Theories of fertility decline: A nonspecialist's guide to the current debate," in John R. Gillis, Louise A. Tilly, and David Levine (eds.), *The European Experience of Declining Fertility, 1850–1970: The Quiet Revolution* (Oxford and Cambridge, MA: Blackwell, 1992), pp. 22–23.

16 Coale, "The demographic transition," cited in note 1, p. 65.

17 John R. Gillis, Louise A. Tilly, and David Levine, "Introduction: The quiet revolution," in Gillis, Tilly, and Levine (eds.), *The European Experience*, cited in note 15, p. 5.

18 David Levine, "Moments in time: A historian's context of declining fertility," in Gillis, Tilly, and Levine (eds.), *The European Experience*, cited in note 15, p. 333.

19 Etienne van de Walle, "Fertility transition, conscious choice, and numeracy," *Demography* 29 (1992): 487–502.

20 This is a leading question, but in fact it stems from a comment made about her mother's fertility.

21 Gigi Santow argues that the "resonances of the term 'calculus'" in Coale's condition should be avoided. She suggests reinterpreting the requirement more broadly, seeing only "a general desire for some control over the timing of conception" as necessary for controlled marital fertility; Gigi Santow, "*Coinitus interruptus* and the control of natural fertility," *Population Studies* 49 (1995): 23.

22 Indeed, the very use of the word "successful" is problematic and dependent on assumed understandings of the aims and desires of particular actors.

23 Secombe, *Weathering the Storm*, cited in note 7, p. 192; Louise A. Tilly and Joan W. Scott, *Women, Work, and Family* (New York: Holt, Rinehart and Winston, 1978), p. 172.

24 van de Walle, "Fertility transition," cited in note 19, pp. 496, 495.

25 See also the "language of fatalism" in Ellen Ross, *Love and Toil: Motherhood in Outcast*

London 1870–1918 (Oxford: Oxford University Press, 1993), p. 98.

26 Richard M. Smith, "Fertility, economy, and household formation in England over three centuries," *Population and Development Review* 7 (1981): 618–619.

27 Simon Szreter has indicated a certain, though perhaps not fundamental, dissatisfaction with the concepts of spacing and stopping, arguing that they are not "mutually exclusive strategies" and that a more complex notion of patterning that differentiates "late spacing" from "stopping" is necessary. Szreter, *Fertility, Class and Gender*, cited in note 6, pp. 433 and 593.

28 She suffered from breast abscesses after both births.

29 Again these figures should not be seen as statistically important indications of the extent of birth control use but are quoted simply to illustrate the varieties of behavior represented.

30 Lewis-Faning, *Report of an Enquiry*, cited in note 7, pp. 138–139.

31 Myra Woolf, *Family Intentions: An Enquiry Undertaken for the General Register Office* (Office of Population Censuses and Surveys, Social Survey Division; London: HMSO, 1971).

32 Ann Cartwright, *How Many Children?* (London: Routledge and Kegan Paul, 1976), pp. 19, 32, 165.

33 See also John Peel and Griselda Carr, *Contraception and Family Design: A Study of Birth Planning in Contemporary Society* (Edinburgh and New York: Churchill Livingstone, 1975), p. 2.

34 Eliot Slater and Moya Woodside, *Patterns of Marriage: A Study of Marriage Relationships in the Urban Working Classes* (London: Cassell and Company, 1951), pp. 204, 180. See also Mass Observation, *Britain and Her Birth Rate* (London: John Murray, 1945), p. 55.

35 Brett Harvey, *The Fifties: A Woman's Oral History* (New York: Harper Collins, 1993), p. 89 (emphasis in original).

36 Ralph LaRossa, *Conflict and Power in Marriage: Expecting the First Child* (Beverly Hills and London: Sage Publications, 1977), p. 33.

37 Joan Busfield and Michael Paddon, *Thinking About Children: Sociology and Fertility in Post-War England* (Cambridge: Cambridge Uni-

versity Press, 1977), p. 47. See also the call for "research...on the dynamics of contraceptive use" in Axel I. Mundigo, James F. Phillips, and Aphichat Chamrathirong, "Determinants of contraceptive use dynamics: Research needs on decision and choice," *Journal of Biosocial Science* 11 Supp (1989): 10.

38 A similar argument is presented by Mary Jo Maynes, who criticizes Alwin Ger's characterization of "the prevalent irrationality" among mining families in Saxony in the 1860s and argues for the importance of a "different rationality of limitation," such as those she came across in German autobiographies of members of families who had only small numbers of children but nevertheless felt that "control over fertility was either unthinkable or unmanageable"; Mary Jo Maynes, "The contours of childhood: Demography, strategy, and mythology of childhood in French and German lower-class autobiographies," in Gillis, Tilly, and Levine (eds.), *The European Experience*, cited in note 15, p. 115.

39 Diana Gittins, *Fair Sex: Family Size and Structure, 1900–39* (London: Hutchinson, 1982), ch. 5; Elizabeth Roberts, *A Woman's Place: An Oral History of Working-Class Women 1890–1940* (Oxford: Blackwell, 1984), p. 92.

40 Szreter, *Fertility, Class and Gender*, cited in note 6, pp. 410–411, 430.

41 Busfield and Paddon, *Thinking About Children*, cited in note 37, p. 212. See also Tone Schou Wetlesen, *Fertility Choices and Constraints: A Qualitative Study of Norwegian Families* (Oslo: Solum Forlag, 1991), p. 63.

42 Janet Finch and Jennifer Mason, *Negotiating Family Responsibilities* (London and New York: Tavistock/Routledge, 1993), p. 74 (emphasis in original).

43 It is also possible that expectation of conflict inhibited communication for some couples. Janet Askham contends that many couples avoid the discussion of subjects likely to cause arguments or conflict. Certainly the negotiation of contraception is plausibly a fraught topic. Emotions, opinions, and tempers were likely to run high over aspects of sexual activity and pregnancy. See Janet Askham, *Identity and Stability in Marriage* (Cambridge and New York: Cambridge University Press, 1984), pp. 33–54.

44 John C. Caldwell, "Direct economic costs and benefits of children," in Rodolfo A. Bulatao and Ronald D. Lee (eds.), *Determinants of Fertility in Developing Countries*, Vol. 1: *Supply and Demand for Children* (New York: Academic Press, 1983), p. 470.

45 Induced abortion is the exception here. Women knew more about abortion than men and usually initiated the practice. Moreover, since it was frequently adopted at times of crisis, abortion might be discussed between spouses; however, it was a rarely adopted strategy. It is striking testament to the general male culture of contraception that two interviewees' husbands transgressed gender codes and arranged abortions for their wives.

46 See also Kate Fisher, "'She was quite satisfied with the arrangements I made': Gender and birth control in Britain 1930–1950," *Past and Present* (forthcoming, 2000/2001).

47 Evidence from unpublished research by Susan Cotts Watkins, Ann Rosen Spector, and Alice Goldstein quoted in Robert A. Pollak and Susan Cotts Watkins, "Cultural and economic approaches to fertility: Proper marriage or *mésalliance*?" *Population and Development Review* 19 (1993): 472.

48 J. Mayone Stycos, Kurt Back, and Reuben Hill, "Problems of communication between husband and wife on matters relating to family limitation," *Human Relations* 9 (1956): 213.

49 *Ibid.*, p. 208. Similar results are reported in Mihira V. Karra, Nancy N. Stark, and Joyce Wolf, "Male involvement in family planning: A case study spanning five generations of a South Indian family," *Studies in Family Planning* 28 (1997): 24–34.

50 On similar difficulties for women in contemporary society, see Hilary Thomas, "The

medical construction of the contraceptive career," in Hilary Homans (ed.), *The Sexual Politics of Reproduction* (Aldershot: Gower, 1985), pp. 58–59.

51 David Levine, *Reproducing Families: The Political Economy of English Population History* (Cambridge: Cambridge University Press, 1987), p. 208.

52 Susan Cotts Watkins, "If all we knew about women was what we read in *Demography*, what would we know?" *Demography* 30 (1993): 557. However, Gigi Santow has asked whether we are "correct...in believing that men are always less concerned than women with the limitation of their families"; Gigi Santow, "Coitus interruptus in the twentieth century," *Population and Development Review* 19 (1993): 769.

53 Angus McLaren, *A History of Contraception: From Antiquity to the Present Day* (Oxford: Basil Blackwell, 1990), p. 203.

54 Shani D'Cruze, "Women and the family," in June Purvis (ed.), *Women's History: Britain 1850–1945: An Introduction* (London: UCL Press, 1995), p. 65. Gigi Santow also argues that "male dominance in sexual matters" was one factor supporting the expectation that men should "take charge of contraception"; Santow, "Coitus interruptus in the twentieth century," cited in note 52, pp. 782–783.

55 Busfield and Paddon, *Thinking About Children*, cited in note 37, p. 248.

56 Wally Seccombe, "Men's 'marital rights' and women's 'wifely duties': Changing conjugal relations in the fertility decline," in Gillis, Tilly, and Levine (eds.), *The European Experience*, cited in note 15, p. 66.

Agricultural Adjustment in China: Problems and Prospects

D. GALE JOHNSON

OVER THE NEXT several decades China faces major and difficult adjustments in employment in agriculture and in rural areas more generally. The adjustment problems arise from the need to reduce substantially the level of employment in agriculture while finding efficient substitutes for labor so that agricultural output will grow at approximately the same rate as demand. China faces much larger adjustment problems than most other developing countries at roughly the same per capita income level because the returns to rural labor are far lower relative to urban labor than in such countries as India and Thailand.

As I have argued elsewhere (Johnson 1997), productivity improvement in agriculture is a necessary condition for economic growth and the development of cities. Cities are only possible as farmers produce more food than they need to feed their own families. Only when that occurs can urban places evolve. Cities depend on farmers for their food supply and as a market for the products manufactured in the city that are not consumed by urban residents. The transition in the world from the time 80 to 90 percent of the population lived on farms occurred very recently in human history: about 200 years ago in Western Europe and less than a half-century ago in China and the rest of the developing world.

There is a saying, "No good deed goes unpunished." This saying certainly applies to the farmers of the world. One consequence of farmers' increasing their productivity is that the more rapid the growth of their productivity, the more they need to adjust or to change. If farmers are to share in economic growth, the farmers themselves, their children, or both must adjust by leaving agriculture and finding other employment for their labor. In the majority of cases in both developed and developing countries, a large

percentage of farmers have had to physically relocate to a new place to live and work. In most countries the physical move has meant going to an urban area. Increasingly, however, with improvements in transportation, more nonfarm jobs are available in rural areas. In the case of China, as I will note in greater detail later, governmental policies that restrict migration from rural to urban areas have had the effect of supporting the development of nonfarm jobs in rural areas.

Agriculture must change

Agriculture must change as economic growth occurs. One part of the change is associated with agriculture's contribution to economic growth. This change is associated with the overall increase in productivity that directly contributes to economic growth and to the increase in the total output of food and other products to meet the demands of a larger and higher-income population. The other part is the adjustment or change that agriculture must make if farmers are to share in the benefits of economic growth. Unfortunately, the greater the increase in the rate of growth of productivity in agriculture, the greater the adjustment that agriculture must make to economic growth. The primary and most difficult change required of farmers because of economic growth is the reduction in the labor force engaged in agriculture, first as a percentage of the total labor force and, after a time, the actual reduction in the number of persons engaged in agriculture.

Let us consider how and why agriculture must change as economic growth occurs. I first consider the nature of changes that occur as agricultural productivity increases and as agriculture contributes to meeting the increased demand for food. I then discuss why the fact of economic growth forces agriculture to change.

The nature of change

Farmers are not the only actors in increasing agricultural productivity—that is, the ability to produce more from a given amount of land, labor, capital, and other inputs. In fact, throughout most of human history the productivity of the primary resources used in agriculture—land and labor—increased very little. There were very modest increases in land and labor productivity over the millennia as the length of time land was fallowed was reduced and simple farm tools and draft animals were substituted for labor.

We can credit Ester Boserup (1965) for much of our understanding of how farmers expanded production until the eighteenth century. Until very recently the scarce factor in farm production was labor, not land. Land was relatively plentiful in Europe until very recently. Yields of grain were calculated, not in terms of yields per unit of land but in terms of the ratio of

output to the amount of seeds used. At the end of the seventeenth century the output-to-seed ratios in Europe were, with minor exceptions, on the order of three or four to one, the same ratios that obtained during the late thirteenth and the early fourteenth century (Gimpel 1977). With output-to-seed ratios of this magnitude, it is easy to understand why famines remained a scourge of mankind in Europe until recently. If grain output fell by a quarter, with a yield ratio of four, the amount of grain that could be consumed relative to an average year fell by a third, since a quarter of a year's normal output had to be saved for seed for the next year. A reduction of even a tenth in food intake was a source of pain and suffering.

While farmers in the seventeenth and eighteenth centuries, especially in England and Holland, found ways to increase the productivity of land through the use of animal manures and by planting legumes to provide plant nutrients, the first of the agricultural revolutions—the mechanical revolution—did not have a major impact on labor saving until the invention of the reaper, soon followed by the binder, in the second quarter of the nineteenth century. While labor saving had resulted from the introduction of the plow and other simple farm implements drawn by draft animals, harvesting remained a significant bottleneck until the reaper and binder were invented. Harvesting had to be done within a limited time period, and by the end of the seventeenth century the same instruments were used as in the fourteenth century and earlier: the sickle, the scythe, and the cradle. In the United States the binder reduced the labor requirement for harvesting wheat by 80 percent during the nineteenth century (Cooper, Barton, and Brodell 1947: 3).

The increase in agricultural labor productivity in Europe during the nineteenth century made possible a large increase in urbanization. At the beginning of the century in England the proportion of the population urban was 19 percent, at the end it was 68 percent; on the continent it was 11 percent urban in 1800 and 33 percent urban in 1900 (Bairoch 1988). Not all of the increase in urbanization was attributable to increases in labor productivity in Europe; some of the increases in labor productivity occurred in North America, thereby permitting that area to export grain and other foods to Europe.

In Asia the dominance of agriculture in the economic life of countries persisted much longer than in Europe or North America. In 1891 India was less than 10 percent urban while Japan was only 13 percent urban. China's population was 89 percent rural in 1949 (SSB 1984). In Asia, except for Japan, the measures of human wellbeing were very little different in, say, 1940 than they had been a millennium earlier as measured by infant mortality, life expectancy, or per capita consumption of food. But as productivity in agriculture has improved, major increases in wellbeing have occurred.

Approximately 100 years after the beginning of the modern mechanical revolution in agriculture, a second revolution occurred: the biological

and chemical revolution. The labor-saving devices, including the introduction of the tractor, did not increase yields per unit of land. Except in England and Japan, there were no significant increases in grain yields per hectare of land in the century prior to 1940—not in North America or in Europe and certainly not in the developing world. In the late 1930s the world grain yield, 1.15 tons per hectare, was the same in the developed and the developing world. The first triumph of the biological revolution was the creation of hybrid corn, which became available in the mid-1930s in the United States. Until this time grain yields were only moderately responsive to the application of fertilizer. But with the development of hybrid corn and later hybrid sorghum in the 1950s and the high-yielding varieties of rice and wheat in the 1960s, grain yields were very responsive to the application of fertilizer. Subsequent chemical developments resulted in improved methods of controlling insects and weeds. After centuries in which grain yields had not increased, grain yields have increased by 150 percent between 1940 and the end of the twentieth century. The yield increases have occurred in both developing and developed countries, though first in the developed countries.

The agricultural changes associated with productivity growth overall and with large increases in the productivity of land and labor involve the application of new knowledge (e.g., improved seeds and production practices) and finding substitutes for land and labor. Table 1 provides data on some productivity changes affecting labor and land that occurred in the United States, Japan, and Denmark for 1940–80. In the four decades, output per farm worker in the United States and Japan increased by more than 6 times and in Denmark by nearly 5 times. Output per hectare approximately doubled. The large increase in output per worker was the result of increases in other inputs and productivity change. In 1960 both Japan and Denmark still had significant percentages of their total employment in agriculture: 26 and 24 percent, respectively (Hayami and Ruttan 1985: 462).

TABLE 1 Total agricultural output, number of male workers, agricultural land, and agricultural output per male worker and per hectare, United States, Japan, and Denmark, 1980 (indexed to 1950 = 100)

	United States	Japan	Denmark
Output	174	221	168
Male workers	28	35	35
Land (ha.)	93	94	92
Output/worker	623	642	476
Output/hectare	184	235	184

SOURCE: Hayami and Ruttan (1985): 467–469.

Why change must occur

Agriculture's share of national output declines as economic growth occurs, as measured by per capita growth. Agriculture declines because it is subject to Engel's law, namely that as people's real incomes grow they will spend a smaller and smaller share of that income on food. In other words, the income elasticity of demand for food is less than unity, even at very low levels of per capita income (Johnson 1991: 81). Since the income elasticity of demand for all products of an economy is unity, the income elasticity of all products other than food is greater than unity. This is a simple and well-established relationship, but its effects on agriculture and rural people are neither simple nor insignificant. The adjustment process is further affected by the fact that the price elasticity of demand for farm products is also less than unity. Consequently, if the supply of agricultural products increases by more than the slowly growing demand, farm prices fall, not by a little but by a lot. If any evidence is required for this point, one need only note the decline of farm prices in China over the past two years.

The effects of the low income elasticity of demand for food can be visualized by noting that, at very low levels of income, such as those that prevailed in Europe two centuries ago or in most developing countries at mid-twentieth century, food accounted for 70 to 80 percent of total consumption expenditures. Today in the high-income countries total expenditures on food, including processing, transportation, wholesaling, and retailing, are about 15 percent in Western Europe and 10 percent in the United States. In the high-income countries agriculture's share of the gross domestic product has fallen to 5 percent or less, approaching 2 percent in the United Kingdom and the United States. People living in the industrial countries are far better fed today than they ever were before. The low percentage of their incomes they spend on food is more than adequate to provide for their needs.

If the much slower growth of demand for agricultural output than for the output of the rest of the economy were not enough of a burden for farmers to bear, the adjustment process is exacerbated by rapid productivity growth in agriculture as economic growth occurs. The evidence from the high-income members of the OECD is very clear. Productivity growth in agriculture has been greater than in nonagriculture for the last several decades. This is true for both total factor productivity—the growth of output per unit of all inputs—and for labor productivity. In these countries from 1967–68 to 1983–84, labor productivity in agriculture increased at an annual rate of 4.3 percent compared to 2.6 percent in the rest of the economy (Johnson 1991). From 1960 to 1990 the growth of total factor productivity in OECD countries was 2.7 percent in agriculture compared to 1.5 percent in manufacturing (Martin and Mitra 1993). Labor productivity increasing at 4.3 percent annually will double in 16 years: after 16 years the same total agricultural output can be produced by half the number of workers.

The primary adjustment that agriculture must make to economic growth is to change both the quantity and the composition of the resources it uses. If returns to resources used in agriculture are to be similar to those in the rest of the economy, agriculture's declining share of national output must be followed by a declining share of the nation's labor and capital resources.

The agricultural policies of most countries are designed to influence the prices of farm products, but in the long run it is not the prices of farm outputs that determine the income of farm families (Johnson 1991: chs. 11 and 12). It is through the factor or resource markets that farmers are able to share in the fruits of economic growth. Governments are prone to intervene in the prices of farm products and seldom, if ever, undertake policies to improve the functioning of factor markets, especially the market for labor. When governments do intervene in factor markets, it is nearly always in the credit markets by lowering the cost of credit to farmers. This effort is misguided because if the cost of capital to agriculture is subsidized, even more labor must leave agriculture than if capital were acquired at its real cost to the economy. It is no favor to farmers to give them access to cheap credit.

The returns to labor in agriculture are determined primarily by the access farmers have to employment in the rest of the economy and by their investment in human capital. Governments have seldom, if ever, aided the transfer of labor from farm to nonfarm employment, especially if that transfer requires migration from rural to urban areas. China, as is well known, has long followed a policy of strictly limiting such migration and today still follows policies that significantly inhibit rural-to-urban migration. The consequence of such policies in China has been a differential between the returns to labor in rural and urban areas that is very large compared to what it would have been in the absence of restrictions on such migration.

However, even if no policy restrictions are placed on labor mobility or migration, a period of a significant shift of labor out of agriculture will be characterized by a significant difference in the returns to labor in rural and urban areas. The reason is simple: a significant earnings differential is required to induce the required flow of workers from rural areas. During periods of economic growth that occur while agriculture provides a significant share of total employment—say a fifth or more of the total—the transfer of labor is large. For example, from 1961 to 1970 farm employment in the United States declined annually by 4.4 percent, in the European Community by 4.6 percent, and in Japan by 4.5 percent (Johnson 1991: 273). At these rates farm employment declined by more than a third in one decade. The change is large both as a percentage of farm employment and in terms of new job creation outside of agriculture.

The margin between the returns to farm and nonfarm labor must be large enough to induce a rapid transfer to nonfarm jobs. Imagine the size of the incentive required to induce one out of 22 current workers plus all new

entrants to the farm labor force to annually change to another job when many of the changes actually require migration—leaving home, so to speak. This has to happen not once, but every year for decades. While the absolute number of workers who must leave agriculture declines over time, experience has indicated that for several decades approximately the same percentage of farm workers leave each year until most of the discrepancy between the earnings of farm and urban workers is eliminated. The time required to largely eliminate the differential returns to labor depends on the magnitude of that differential, the income elasticity of demand for farm products, the rate of productivity change in both agriculture and the rest of the economy, and the rate of growth of the rural labor force. In the case of China, the differential will not be eliminated by 2030, the period included in this analysis.

Analysis of the problem in China is complicated by the current high percentage of rural employment that is in the nonagricultural sector—high for a country at its level of income. Data suggest that differences between the returns to individuals in rural areas, whether they derive their earnings from farming or from nonfarm work, are not large if adjustment is made for differences in gender, education, and age.¹ This indicates that the adjustment problem is not solely related to agriculture but involves the entire rural population. According to data published by the State Statistical Bureau (SSB 1998), in 1997 some 57 percent of rural workers were engaged in agriculture. This estimate is based on the assumption that 283.5 million workers were employed in agriculture and that total rural employment was 494 million.

Clarifications of agricultural and other employment data

China's State Statistical Bureau provides employment data for farming, forestry, animal husbandry, and fishing as one group. When I speak of agriculture or farming in China, I include only farming and animal husbandry. When I refer to the State Statistical Bureau's designation of agriculture, the reference is to the four categories. I have derived employment estimates for agriculture or farming by the share of the gross output of the four categories that comes from farming and animal husbandry. This approach assumes that the employment per unit of gross output is the same across the four

¹ On the basis of data from Sichuan Province, Yaohui Zhao found that if a worker shifted from farm to local nonfarm work, family income increased by 13 percent, while a shift of one worker to migrant work increased family income by 49 percent (Zhao 1999). The local nonfarm workers were better educated than farm workers (years of school: 8.2 versus 6) and a larger proportion were male (74 percent versus 47 percent). These differences would explain a large part or all of the effect on household income of having a nonfarm job compared to working on the farm.

categories.² In 1997 the share of farming and animal husbandry was 87.5 percent of the gross output from the four categories. Consequently the 1997 employment of 324.3 million workers for farming, forestry, animal husbandry, and fishery (SSB 1998: 385) was reduced by 12.5 percent to arrive at an employment estimate for agriculture of 283.5 million.³

Three other employment figures for 1997 are relevant to this topic. One is employment in primary industry, which was 347.3 million; another is rural employment of 493.9 million, and the third is total employment of 696 million (SSB 1998: 127). The total population in 1997 was 1,236.3 million of which the rural population was 866.4 million, or 70.1 percent (SSB 1998: 105). This is almost identical with the share of rural employment in total employment, namely 70.9 percent.

If 100 million rural migrants are living in cities all or part of the year, agricultural employment may be nearer to 235 million, estimated on a full-time basis, than to 283.5 million and total rural employment may be about 440 million. Whichever figure is nearer to the truth, it is obvious that the magnitude of the adjustment required to more nearly equalize earnings in urban and rural areas is very great indeed. But an important point is that rural nonagricultural workers as well as agricultural workers suffer from a very large income disadvantage. The income disadvantage of rural nonagricultural workers will only be eliminated as a consequence of an overall adjustment between the rural and urban labor forces. As long as agricultural workers have earnings that are low compared to urban workers, after adjustment for human capital differences, the earnings of rural nonagricultural workers cannot depart too far from the earnings of comparable individuals who are engaged primarily in farming. To repeat, the labor adjustment required by economic growth must involve all rural workers, not just those in agriculture, if the considerable difference between urban and rural labor earnings is to be largely eliminated.

Adjustments facing China's agriculture

China has already undergone a significant adjustment in agriculture over the past half-century, especially in the past two decades. In 1952 farming,

² The gross output value of animal husbandry includes the grain and other crop products consumed by the animals. The 1990 volume of *China Agricultural Yearbook* provides data on both the gross and net output values by the separate categories noted in the text. For 1997 crop farming plus animal husbandry accounted for 83.7 percent of the gross output value and 82.6 percent of the net output value (SSB 1998: 215). For 1997 the 1998 edition of *China Statistical Yearbook* lists the share of farming and animal husbandry in the gross output including forestry and fishery as 87.5 percent, and this is what I used to arrive at the estimated employment of 283.5 million workers in agriculture or farming. Since there was little difference for 1990 between the distribution of gross and net output of the sectors, I have accepted the data for 1997 based on the distribution of gross output.

³ On page 132 of the 1998 *China Statistical Yearbook*, the employment figure for farming, forestry, animal husbandry, and fishery is given as 330.95 million. In my calculations of the amount of employment in agriculture or farming, as I have defined it, I have used the figure of 334.3 million from page 385 of the same volume.

forestry, animal husbandry, and fishery represented 83.5 percent of total employment. By 1978 the same activities provided for 73.8 percent of total employment. The absolute level of employment in this group of activities increased from 173.1 million to 294.3 million. By 1997 their share of total employment had declined to 47.5 percent, a remarkable decline from the 73.8 percent in 1978.⁴ Total employment in agriculture as defined by the State Statistical Bureau increased from 284.6 million in 1978 to 324.3 million in 1997. According to the available data (SSB 1998: 388) agricultural employment peaked at 341.9 million in 1991 and declined by 18 million by 1997. China is now in the phase of agriculture's employment declining absolutely as well as relatively.

It is probable that agricultural employment is now significantly lower than my estimate of 283.5 million. As noted earlier, many millions of rural workers spend part or all of each year working in urban areas: some analysts put the figure as high as 100 million. It seems that many if not most of these workers are still counted as employed in agriculture, since urban employment has not increased enough over the past decade or so to account for even a small percentage of the migrant workers. If there are 100 million rural migrants in urban areas and they spend half the year in the city, this implies that employment in agriculture is now on the order of 233.5 million rather than the 283.5 million based on the official estimate.⁵

Accepting the yearbook data, we find that in 1978 some 92.4 percent of employment in rural areas was in agriculture. By 1997 this figure had declined to 57 percent, reflecting the large increase in nonagricultural jobs as well as the data revision that occurred for 1990 and later years. These data imply a very large increase in the importance of nonagricultural jobs in rural areas. Whether one accepts a level of agricultural employment of 283.5 million or, possibly, 233.5 million, the magnitude of the labor adjustment facing rural people is enormous. The rural population of 866 million

⁴ There is a major discontinuity in the total employment figure between 1989 and 1990 that affects the share of farming, forestry, animal husbandry, and fishery in total employment. Total employment (and the economically active population) increased by 15.5 percent between 1989 and 1990, without a word of explanation in the 1997 edition of the *China Statistical Yearbook* (SSB 1997: 94). In the 1996 edition of *China Statistical Yearbook* (SSB 1996: 90) the increase in total employment between 1989 and 1990 was 2.6 percent. Employment in SSB's designation of agriculture increased by only 2.7 percent in 1990 over 1989, which seems reasonable as a measure of year-to-year change (SSB 1998: 388). However, employment in primary industry increased by 15.7 percent from 1989 to 1990 (SSB 1998: 128). In 1989 the employment in primary industry was the same as in farming, forestry, animal husbandry, and fishing and increased by only 2.7 percent during the year. The number of employed persons in the entire economy increased by 85.8 million between 1989 and 1990, of which the increase in rural employment accounted for 63.5 million (SSB 1998: 130-131). All of this increase in employment in rural areas was outside of agriculture, forestry, animal husbandry, and fishing. Employment in urban areas increased by 22.3 million. The revision of the data did not affect the distribution among primary, secondary, and tertiary sectors between 1989 and 1990 and had relatively little effect on the distribution between rural and urban employment. Quite mysterious!

⁵ Another difficulty with the data for rural areas is that employment in township and village enterprises has also been revised and for 1997 is said to be 91.6 million, down from 135.1 million in 1996 (SSB 1998: 131). There was no explanation of the change except to note that the figure was revised by the Bureau of Township Enterprises of the Ministry of Agriculture and that the figure for 1997 is not comparable to those of other years (SSB 1998: 127). However, in the 1999 edition of the *China Statistical Yearbook* (SSB 1999: 133) employment in township and village enterprises in 1997 is given as 130.5 million and for 1998 as 123.4 million.

is now increasing at an annual rate of a little more than 1 percent, which means the population would grow by about 9 million each year in the absence of rural-to-urban migration. Because of the somewhat higher birth rates in rural areas in the early 1980s than today, the rural labor force for some years to come will continue to grow at a higher rate than the total population. The labor force may be growing by as much as 6 million per year. If farm employment is to decline by 3 percent annually, in the next few years approximately 7 million workers must leave agriculture.⁶ If total employment in rural areas is approximately 500 million, the annual number of migrants plus entrants into new nonagricultural jobs in rural areas must number roughly 15 million if farm employment is to decline by 3 percent annually. If half of the new jobs are created in rural areas, the migration of workers must be approximately 7.5 million annually. If family members accompany many of the workers, the total number of migrants would be substantially greater, perhaps an annual total of 15 million.

A 3 percent annual reduction in agricultural employment from 1997 to 2030 would reduce farm employment from 283.5 million to about 104 million, or by 63 percent. This would still leave agricultural employment in China at 10 percent of the projected national employment figure of 1,006 million. A 3 percent annual reduction would also narrow the earnings disparity between urban and rural areas, although it would fail to eliminate it. Such a reduction in farm employment would permit farmers to share in the benefits of economic growth.

Reduction of the farm labor force

The desired outcome of the reduction in farm employment is to narrow the earnings differential between urban and rural workers while in no way endangering China's food supply. The increase in relative earnings of farm and rural workers depends on changes in productivity of labor in rural areas and the degree to which a balance is maintained between the growth of supply and demand for farm products.

If one accepts the published data on employment in agriculture, the annual increase in labor productivity in agriculture was about 4.5 percent from 1985 to 1997.⁷ I start with 1985 rather than 1978 to avoid including the

⁶ The 3 percent annual reduction in farm employment was not chosen arbitrarily, nor is such a reduction a particularly high rate of decline. From 1950 through 1980 the annual rate of reduction of farm workers in the United States was 4.2 percent; in Japan it was 3.4 percent; in Denmark 3.4 percent (Hayami and Ruttan 1985: 467–469). South Korea in 1975 had 46 percent of its employment in agriculture, and by 1997 it had 12 percent (FAO); the annual rate of reduction in the numbers employed in agriculture was 3.5 percent.

⁷ I do not have access to data that permit a direct estimate of the changes in labor productivity in agriculture over time. I have used two rough measures. One is the data on employment and gross domestic product in primary industry, which includes agriculture, forestry, fishing, and mining, though agriculture is by far the largest component. The other is the change in employment in farming, forestry, animal husbandry, and fishery and the gross output value of crop production alone. The gross value of output of farming, forestry,

TABLE 2 Projections of employment for China assuming 3 percent annual decline in farm employment, 1997–2030

Year	Total population ^a (millions)	Employment				
		Total ^b (millions)	Farm ^c		Nonfarm	
			(millions)	(%)	(millions)	(%)
1997	1,221	696.0	283.5	41	412.5	59
2000	1,255	725.6	258.7	36	466.9	64
2005	1,302	779.4	222.2	28	557.2	72
2010	1,348	844.2	190.8	23	653.4	77
2015	1,392	894.3	163.8	18	730.5	82
2020	1,435	936.7	140.7	15	796.0	85
2025	1,471	971.9	120.8	12	851.1	88
2030	1,501	1005.7	103.7	10	902.0	90
Avg. annual change (%) 1997–2030	0.63	1.12	-3.0	—	2.4	—

^aPopulation estimated from Bos et al. (1994).

^bBased on population growth lagged 20 years, starting with labor force at 57 percent of population. Because of the declining rate of population growth over time, labor force participation in 2030 is estimated to be 67 percent.

^cFarm employment, estimated to be 283.5 million in 1997, is assumed to decline at an annual rate of 3 percent. If farm employment were 233.5 million in 1997 and declined at 3 percent annually, farm employment in 2030 would be 85.5 million and would account for 8.5 percent of total employment.

large increase in labor productivity that occurred in the early years of the reform attendant on the change in the institutional and incentive structures (Lin 1992). One must also remember that labor adjustment in agriculture is chasing a moving target. Real returns to labor in the rest of the economy will also be increasing, though not as rapidly as in agriculture.

Table 2 presents projected employment data based on the model of change that I have constructed. It is based, first, on the assumption of a 3 percent annual decline in farm employment starting with 283.5 million in 1997 and, second, on the observation that the total labor force will grow at the same annual rate as population growth has or is projected to grow, assuming a 20-year lag. In addition to the changes in total population and in farm and total employment, the number of nonfarm jobs required is indicated. The projections start at 1997 and are given for every five years starting in 2000 and ending in 2030.

animal husbandry, and mining includes a significant amount of double counting—the feed for animals is included in the output of farming, for example. The increase in the gross output value of farming from 1985 to 1997 was 70 percent; for the combined group, 107 percent. The increase in the gross domestic product originating in primary industry was 64 percent. The share of forestry and fishing in the total gross output value of farming, forestry, animal husbandry, and fishing was 87 percent in 1985 and 88 percent in 1997. Using the output data for farming alone gives an annual rate of increase of labor productivity of 4.5 percent on the basis of the official employment data. Given the large number of rural workers and the increase in that number between 1985 and 1997 who spend a major fraction of their time each year in urban places, it is highly probable that an estimate of labor productivity growth in agriculture of 4.5 percent is on the low side.

A brief summary of the results is indicated by the average annual percentage changes for the 33 years given in the last row of the table. The average annual increase of total employment is 1.12 percent, while population grows by an average of 0.63 percent annually; the average rate of growth of nonfarm employment required to accommodate the growth in the labor force and the stipulated 3 percent annual decline in farm employment is 2.4 percent. This implies an average increase in the number of nonfarm jobs of 14.8 million annually over the 33-year period, which seems staggering compared with 11 million nonfarm jobs created annually during the reform period from 1979 to 1995. But if one considers that the annual rate of new nonfarm job creation for the reform period was 5.5 percent, this puts the task in a different light (SSB 1996). This earlier rate of annual growth in nonfarm employment is more than twice as great as the average rate that will be required in the future. It seems achievable.

Will China's food production suffer?

Is there a basis for concern that such a large withdrawal of labor from agriculture would significantly limit the growth of food output? The evidence from many other countries, such as given in Table 1, strongly suggests that the concern is unwarranted. The rate of growth of agricultural output in the three countries shown in the table, and in others, has been little affected by large-scale withdrawal of labor from agriculture. The primary reason has been that the mechanical, biological, and chemical revolutions of the past two centuries have made it relatively easy to substitute other inputs for both farm labor and land. Because the withdrawal of labor from farming increases the real returns to labor relative to the costs of capital and current inputs, it is profitable for farmers to make the substitutions.

Given the current organization of agriculture in China, the withdrawal of labor will be associated with a decline in the number of farm operating units. Will this mean that the average size of farm units will increase significantly? If this were to occur, the current small scale of farms—about 0.5 hectares on average—would increase, permitting greater returns to scale. However, even though the reduction in the agricultural labor force projected for 2030 is about 63 percent compared with the 1997 level, the number of farm units is likely to decline by much less and there may be only a small increase in the average land area size of the farm operating unit.

Experience with the decline in farm employment in East Asia indicates that large declines have not been followed by similar percentage declines in the number of farms. In Japan between 1950 and 1985 farm employment declined by 70 percent, but the number of farms declined by just 29 percent (Hayami and Yamada 1991: 66 and 251–252). In South Korea the de-

cline in agricultural employment between 1975 and 1997 was 53 percent, while the number of farms decreased by less than 18 percent. In Taiwan the number of farms declined by only 8 percent between 1966 and 1997, while associated employment fell by 49 percent. Throughout East Asia, as well as in Europe and North America, a large majority of families designated as agricultural are part-time farmers, receiving more of their income from non-farm than farm activities. I believe that China will experience the same pattern. According to rural household surveys in China, 41 percent of the basic income of farm households in 1997 came from nonfarm sources (SSB 1998: 345).

Nevertheless, the smaller percentage decline in the number of farms than in the number of workers has not prevented large increases in total farm output or in the productivity of labor and land. Again, let us look at data from East Asia. In Japan, according to Table 1, agricultural output between 1950 and 1980 increased by 121 percent while labor input declined by 65 percent and output per worker increased by more than 500 percent. In Korea from 1975 to 1997 agricultural output increased by 42 percent and output per worker trebled in little more than two decades (FAO). In Taiwan between 1968 and 1997 output doubled, the labor force declined by 49 percent, and labor productivity quadrupled.

Are the rates of growth of agricultural output documented for East Asia sufficient to meet the likely growth of demand for farm products in China? During the periods just noted, agricultural output in Japan grew by 2.1 percent annually, in Taiwan by 2.0 percent, and in South Korea by 1.6 percent. Since *pari passu* both Japan and Korea have become significant importers of food, there may well be concern about what lies ahead for China. But as late as 1995 Taiwan had exports of food and live animals that almost exactly equaled its imports of the same products; its small excess of imports over exports of animal and vegetable oils was less than 0.2 percent of its total value of exports (DBAS 1998: 216–217). Since 1978, the beginning of the period of rural reforms in China, the growth of food production has slightly exceeded the growth of demand, and China is now a net exporter of agricultural products. In the last years of the 1990s, it has been a small net exporter of grain (SSB 1999: 586 and 589). And at the beginning of 2000 China has huge stocks of grain—equal to a year's consumption (Chen 2000: 23).

The future growth of demand for food in China will be much slower than during the latter part of the twentieth century. The primary reason will be the sharp reduction in population growth, declining from 1.68 percent annually during 1965 to 1997 to a projected growth rate of 0.63 percent for 1997 to 2030 (Bos et al. 1994: 182–183). The future rate of growth of real per capita incomes will likely be lower than in recent decades. Consequently, the rate of growth of food production in China can be signifi-

cantly less than what was achieved since 1978 and still meet the growth in its demand.

What can be done to facilitate the adjustment?

The major policy change that can be made to facilitate the required adjustment in the rural labor force is to equalize the educational opportunities between rural and urban areas. In the past and at present, urban residents have access to more and better education than their rural counterparts. China is in no way unique in this regard: all of the now-developed countries showed differences unfavorable to rural areas in the provision of education until the rural population became a relatively small share of the total. But there is no reason why China should repeat the mistakes of others.

The costs of these mistakes have been high and will continue to be so in China. Large-scale migration from rural to urban areas in China cannot be prevented. Urban areas will be greatly benefited if the majority of the rural residents who move to the cities are as well educated as urban residents are. Urban areas have generally resisted accepting migrants from the countryside, and this circumstance prevails in China today. One reason for this negative attitude is that many rural migrants have limited education and are not well equipped to adjust to the conditions of urban life.⁸ The fault here lies not with the migrants but with urban bureaucrats who set the education policy for rural areas. China spends far too little on education; it allocates a smaller percentage of its gross national product to education than most other countries in the world. In 1995 China spent only 2.3 percent of GNP on education; India, by comparison, spent 3.5 percent. The low-income countries as a group spent 5.5 percent (World Bank 1999: 200–201). China today would clearly be in a better position to solve some of its difficult adjustment challenges if it had devoted more of its GNP to investment in human capital. Many of its investments in physical capital including infrastructure have not turned out very well in the past, and there is not much reason to believe that the future will be very different. A shift of a small percentage of investment in physical capital, which in recent years has equaled or exceeded 40 percent of GDP (SSB 1998: 67), toward greater investment in human capital is clearly warranted and is in the long-run interest of the urban population.

In addition to improving educational opportunities in rural areas, China's policy should be oriented toward making rural areas more attrac-

⁸The negative attitude of many urban people in China has historical roots. I found the following statement in an archaeology museum in Ankara, Turkey: "We have found that the provinces are becoming denuded of people, and this great city of ours becomes disturbed by a great multitude of all kinds of people, especially those of rural areas, who have left their own towns and their agricultural pursuits in order to take refuge here." The city in this case was Constantinople.

tive places in which to live and work. This effort involves substantial additional investments in infrastructure, including roads, electricity, communication, and facilities for social and cultural activities. It seems obvious that the huge numbers of people who will be affected by the process of agricultural adjustment cannot be absorbed by the existing large and medium-sized cities. New cities must develop or emerge out of existing towns. But the adjustment process will be eased if significant growth occurs in non-farm employment opportunities in rural areas. If such employment in rural areas is available for 200 million residents over the next decade, the agricultural adjustment process will be significantly smoother than if most of these workers and their families have to move to new communities.

Certain changes that directly affect agricultural production in China would also be desirable. The decline in agricultural employment will require a substantial increase in investment in machinery, equipment, and buildings. Currently agriculture is not well served by the banking system. One reason is that land is collectively owned, and farmers only have the right to use the land. Throughout most of the world, land serves as the main collateral for loans to farmers; this basis for credit does not exist in China. While it is legal for farmers to rent their land-use rights to others, the land-rental market is not well developed. One reason is that if a family rents out all or most of its land for a period of time, the village officials may decide that the family no longer needs the land and assign the land-use rights to someone else. Thus farm families are reluctant to rent their land-use rights.

The adjustment process will require an increase in the size of farms. The present institutional arrangements are not conducive to a smooth transition to larger farm units. Their enlargement would be encouraged by permitting farmers to own the land they farm and to allow land to be freely bought and sold. A well-functioning land-rental market would also assist in the adjustment in farm sizes.

Above all else, meeting the growing demand for food requires that China continue to give high priority to investments in agricultural research. The recent rapid growth of food production in China has been facilitated by past investments in such research.

Concluding comment

In one sense it appears that China faces an impossible task in reducing its farm labor force to 10 percent or less of total employment over the next three decades. The requirement of creating very large numbers of new non-farm jobs appears to be exceedingly difficult to achieve. But history provides convincing evidence that it can be achieved. Other countries, especially the rapidly growing economies in East Asia, have undergone the same

adjustment and within a similar length of time. China, in its reform period, has created new nonfarm jobs at a much higher annual rate than will be required in the future. In fact, the rate of new nonfarm job creation from 1978 to 1995 is more than twice what the future will require. If there is the will, the way will not be exceedingly difficult.

References

- Bairoch, Paul. 1988. *Cities and Economic Development: From the Dawn of History to the Present*. Chicago: University of Chicago Press.
- Bos, Eduard, My T. Vu, Ernest Massiah, and Rodolfo A. Bulatao. 1994. *World Population Projections, 1994–95 Edition*. Baltimore: Johns Hopkins University Press.
- Boserup, Ester. 1965. *The Conditions of Agricultural Growth: The Economics of Agrarian Change Under Population Pressure*. Chicago: Aldine.
- Chen Xiwen. 2000. "A turning point in grain supply–demand and agricultural restructuring," *China Development Review* 2(2).
- Cooper, Martin R., Glen T. Barton, and Albert P. Brodell. 1947. *Progress of Farm Mechanization*. US Department of Agriculture, Misc. Pub. No. 630. Washington, DC: US Department of Agriculture.
- Directorate-General of Budget, Accounting and Statistics (DBAS). 1998. *Statistical Yearbook of the Republic of China*. Taipei: Executive Yuan.
- Food and Agriculture Organization (FAO). Various years. *Production Yearbook*. Rome: FAO.
- Gimpel, Jean. 1977. *The Medieval Machine: The Industrial Revolution of the Middle Ages*. New York: Penguin Books.
- Hayami, Yujiro and Vernon W. Ruttan. 1985. *Agricultural Development: An International Perspective*. Rev. Ed. Baltimore: Johns Hopkins University Press.
- Hayami, Yujiro and Saburo Yamada. 1991. *The Agricultural Development of Japan: A Century's Perspective*. Tokyo: University of Tokyo Press.
- Johnson, D. Gale. 1991. *World Agriculture in Disarray*. 2nd ed. London: Macmillan.
- . 1997. "Agriculture and the wealth of nations," *American Economic Review* 87(2): 1–12.
- Lin, Justin Yifu. 1992. "Rural reforms and agricultural growth in China," *American Economic Review* 82(1): 34–51.
- Martin, Will and Devashish Mitra. 1993. "Technical progress in agriculture and manufacturing." Mimeo. World Bank.
- Ministry of Agriculture. 1992. *China Agricultural Yearbook*. Beijing: Agricultural Publishing House.
- State Statistical Bureau (SSB). Various years. *China Statistical Yearbook*. Beijing: China Statistical Publishing House.
- World Bank. 1999. *World Development Report: Knowledge for Development*. New York: Oxford University Press.
- Zhao, Yaohui. 1999. "Labor migration and earnings differences: The case of rural China," *Economic Development and Cultural Change* 47(4): 767–782.

Crime, Gender, and Society in India: Insights from Homicide Data

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FREEDOM FROM VIOLENCE, as an aspect of the quality of life, is a neglected issue in development studies. Most people would rather avoid being mugged, beaten, wounded, or tortured, and it is also nice to live without fear of these traumatic experiences. Thus, protection from violence may be thought of as one of the “capabilities” that contribute to the quality of life (Sen 1985). Violence also affects human wellbeing in indirect ways, as when armed conflicts undermine economic growth or the functioning of public services. If development is concerned with improving the quality of life, the issue of violence should be a major interest of the discipline. Yet, it tends to receive little attention outside specialized circles.

There is another reason why protection from violence is a “capability” of much interest: it does not necessarily improve as income levels rise. Many other basic capabilities, such as nutrition, longevity, and literacy, are positively related to per capita income and tend to improve with economic growth even in the absence of direct intervention. Protection from violence, however, is not a convenient byproduct of economic growth, and indeed there are spectacular cases of violence rising against a background of rapid improvement in per capita income and other development indicators. Dealing with violence in a society is, therefore, intrinsically a matter of public action. The latter, in turn, calls for careful investigation of the causes of violence.

One possible reason (among others) why violence is an under-researched issue in development studies is the paucity of relevant data. War-torn zones are not the best site for a household survey, and even basic data on criminal violence in developing countries are seldom available in a convenient and reliable form. The Indian government, however, publishes a

good deal of information on murders; this study is a preliminary attempt to analyze these data.

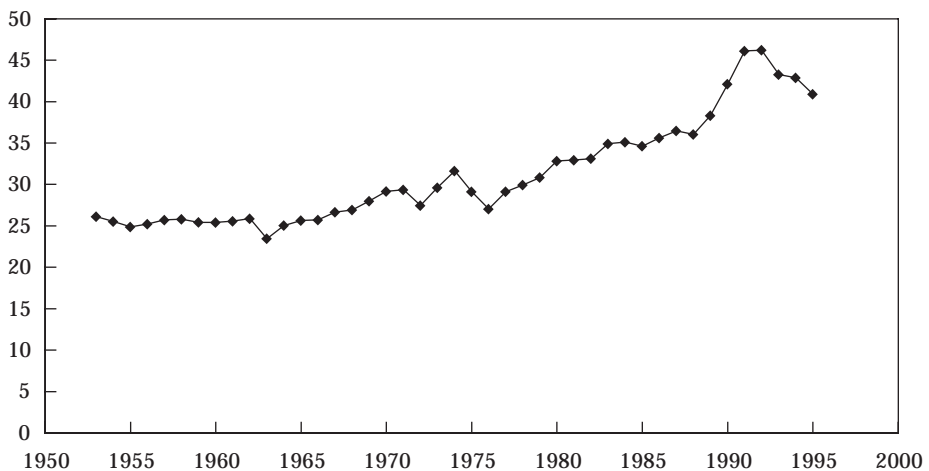
Our main concern is to explore the links between murder rates at the district level and such socioeconomic variables as poverty, urbanization, literacy, and the demographic and social composition of the population.¹ Regression analysis points to a robust negative correlation between murder rates and the female–male ratio in the population. This pattern receives special attention in this study.

Data and issues

Crime in India, an annual publication of the Government of India (Ministry of Home Affairs), presents district-level data on a range of “crimes” such as murder, rape, kidnapping, theft, burglary, and arson. These statistics are compiled from police records. One suspects a good deal of underreporting for most of these crimes, but murder data are likely to be fairly accurate.² Accordingly, we restrict our attention to murders.³ It is worth noting that crime rates are not well correlated across different types of crime. For instance, the ranking of Indian states by level of crime varies a great deal depending on which crime one is looking at (an exception is Kerala, which has low levels of crime across the board). Similarly, trends over time often diverge between different types of crime.⁴ Thus, the findings of this study may not apply to crimes other than murder.

Figure 1 plots the all-India murder rate (murders per million persons) from 1953 to 1995. A significant upward trend can be seen from the mid-

FIGURE 1 Murder rate in India, 1953–95 (murders per million population)



SOURCE: Calculated from *Crime in India 1995*, pp. 4 and 8.

1970s onward. In 1995, the murder rate was 41 per million. This is a relatively low murder rate for a country in the “medium human development” category.⁵ Interestingly, the *Crime in India* data suggest that murder rates are not markedly higher (on average) in urban areas than in rural areas.⁶ A striking pattern is the wide variation between major cities, where murder rates in 1995 ranged from 7 per million in Calcutta to 164 per million in Patna.

Some basic features of homicide in India can be gleaned from case studies, police reports, and related sources.⁷ Offenders are mainly young men. Murders by women are extremely rare and are usually committed in response to provocations such as harassment or infidelity. (Infanticide is another significant category, largely unrecorded.) In the case of murders committed by men, folklore has it that the main motives are “*zan, zar, and zamin*” (women, gold, and land).⁸ Despite an element of stereotype here, the general notion that disputes relating to property and women account for a substantial proportion of murders is consistent with the evidence (such as it is) from police records and court proceedings.⁹ Altercations and vendettas are other common antecedents. Scattered evidence suggests that perpetrator and victim often belong to the same family, caste, community, or peer group. In a case study of 144 convictions for murder in central India, Driver (1961) found that victim and offender belonged to the same caste in 84 percent of the cases.¹⁰ The main motives for murder were disputes over property, living arrangements, sexual matters, and transgressions of social norms.

Earlier statistical analyses of Indian crime data are few and far between. A noteworthy contribution is Baldev Raj Nayar’s *Violence and Crime in India* (Nayar 1975).¹¹ The author focuses on temporal and regional patterns in crime rates and how these might be explained. Unfortunately, his statistical analysis of the determinants of “murder and kidnapping” (pp. 121–122) produced little result, partly because it was based on a mere 18 observations (one for each state). Interestingly, “police strength” had a positive coefficient in this regression, but this finding has to be interpreted with caution, given the possibility of reverse causation.¹²

In the concluding pages of his book, Nayar pointed out that “district level data may provide more satisfactory results in respect of the social and economic correlates of violence and other crime” (p. 128), but no one seems to have pursued this useful hint. Philip Oldenburg (1992), however, noticed an interesting pattern based on district-level data for Uttar Pradesh: there is a negative correlation between the incidence of murders and the female–male ratio in the population. As we shall see, this pattern also applies to India as a whole (even after controlling for a wide range of other variables), though probably for reasons different from those suggested by Oldenburg.

Aside from extending the earlier work of Nayar and Oldenburg, our analysis investigates two further issues. First, we examine the possible link

between murder rates and various indicators of modernization and development such as urbanization, literacy, and the level of poverty. One common assumption in this respect is that modernization is associated with high murder rates. This conjecture receives little support from empirical studies of crime in Europe and North America (Rogers 1989), but it is worth reexamining in the Indian context.¹³ Second, we scrutinize the relation between crime rates and the social composition of the population.

Regression variables

Little material is available to construct a plausible “model” of crime in India, and we shall not attempt to do so.¹⁴ Instead, our starting point is the “statistical approach” to regression analysis (Deaton 1997: 63), where the regression function is simply interpreted as a conditional expectation: in this case, the expectation of the murder rate conditional on various socioeconomic variables of interest.

The regression variables and their means are listed in Table 1. The unit of analysis is the district, and the reference year is 1981.¹⁵ The relevant data are available for 319 districts, accounting for about 90 percent of India’s total population.

The district is a useful unit of analysis in this context. It is, indeed, natural to focus on the murder rate as a characteristic of the society, rather than on the propensity of particular individuals or households to commit

TABLE 1 Regression variables and their mean values

Variable name	Definition	Variable mean
MURDER	Murders per million persons, 1980–82 (unweighted average of annual figures for 1980, 1981, 1982)	33.4
LITERACY	Crude literacy rate, 1981 (%)	34.1
URBAN	Proportion of the population living in urban areas, 1981 (%)	20.5
POVERTY	Sen index of rural poverty for the region where the district is situated, 1972–73 (%)	17.8
SC	Proportion of scheduled-caste persons in the population, 1981 (%)	16.0
ST	Proportion of scheduled-tribe persons in the population, 1981 (%)	9.2
FMR	Female–male ratio: females per 1,000 males, 1981	933
Q5RATIO	Ratio of male q_5 to female q_5 (q_5 is the probability of dying before age 5), 1981	0.91

SOURCES: *Crime in India* (Government of India, annual) for MURDER; Government of India (1988) for Q5RATIO; Jain, Sundaram, and Tendulkar (1988) for POVERTY; Census of India 1981 for the other variables. The “variable means” are unweighted averages of district values.

murders. A higher level of aggregation than the district, on the other hand, would miss local variations in murder rates and their social context. A state-level analysis, in particular, would be too coarse, as there are wide inter-district variations in murder rates within states. In Uttar Pradesh, for instance, the annual murder rate varies from 2.9 per million persons in Garhwal to 106 per million in Pilibhit.

Our dependent variable is the murder rate (MURDER), defined as the annual number of murders per million persons. For this variable, we have taken an unweighted average of the annual values for 1980, 1981, and 1982. This helps to even out transient variations in murder rates, which are unlikely to have much to do with the right-hand-side variables. State-level means of the murder rate for India's "major states" are given in Table 2. These range between 25 and 32 per million in most states, with much higher murder rates in Madhya Pradesh and Uttar Pradesh, and much lower rates in Kerala.¹⁶

Table 2 also gives state-level means of the independent variables. The latter require little elaboration, except for the poverty indicator. In the absence of district-level poverty estimates, our poverty indicator is the "Sen index" for the region where the relevant district is situated. The "region" is an intermediate unit between the district and the state. Most states have three to five regions, each made up of a collection of contiguous districts. The implicit assumption here is that poverty levels do not vary a great deal between districts within a specific region.¹⁷ Another qualification is that the reference year for our poverty indicator is not 1981 but 1972-73, the clos-

TABLE 2 State-level means of the regression variables

	MURDER	LITERACY	URBAN	POVERTY	SC	ST	FMR	Q5RATIO
Kerala	15	70.4	15.4	20.9	10	1.0	1032	1.12
Orissa	21	34.2	13.1	32.1	13	24.9	981	1.03
Maharashtra	25	44.3	26.0	23.6	7	10.1	961	1.01
Karnataka	25	38.5	24.5	14.5	15	4.9	963	1.02
Gujarat	26	43.7	26.4	15.5	7	14.2	938	0.92
Andhra Pradesh	26	29.9	23.3	15.8	15	5.9	975	1.06
Haryana	27	35.4	21.9	3.7	19	0.0	871	0.82
Rajasthan	27	24.4	19.3	14.8	17	13.8	923	0.89
West Bengal	27	38.8	23.2	28.4	22	7.2	916	0.98
Tamil Nadu	31	46.8	33.0	17.6	18	1.1	977	1.02
Bihar	32	26.2	12.5	24.8	15	8.3	946	0.86
Punjab	36	39.1	27.7	3.8	27	0.0	880	0.88
Uttar Pradesh	50	28.2	18.0	13.0	21	0.5	892	0.84
Madhya Pradesh	51	27.9	19.6	19.3	14	21.1	933	0.96

NOTE: States are arranged in ascending order of the murder rate (first column). For Assam (where the 1981 census did not take place), the relevant data are not available. All entries are unweighted averages of the relevant district values.

est year for which region-level poverty estimates are available. For further discussion of these qualifications, see Murthi, Guio, and Drèze (1995).

Aside from those listed in Table 2, we tried a number of other independent variables, including population density, the proportion of agricultural laborers in the population, and the Gini coefficient of per capita expenditure.¹⁸ However, these variables had unstable coefficients and were not statistically significant. To reduce multicollinearity problems, we dropped them from the regressions reported in the next section.

We begin with ordinary least squares (OLS) estimation. The possibility of a feedback effect from murder rates to female–male ratios will be addressed through instrumental-variable (IV) estimation.

Empirical findings

The main results are presented in Table 3. Our “baseline” regression appears in the first column. Among the development-related variables (literacy, urbanization, and poverty), only literacy has a significant coefficient, with a negative sign. This lends support to the hypothesis that education exercises a moderating influence on criminal violence.¹⁹ In this connection, it is worth recalling that Kerala has some of the lowest crime rates in the country, not only for murders but also for other crimes.

The finding that urbanization bears no significant association with murder rates defies the popular notion that criminal violence is relatively high in cities. As noted earlier, however, this notion is not supported by available crime data. Also, bearing in mind that the main causal antecedents of murder in India appear to be disputes about property, family, and related matters, and that the disputes in question usually involve closely related persons, we would not expect particularly high murder rates in urban areas, with their more anonymous environment and formalized property rights.²⁰ What does seem to be a matter of concern is the emergence of a culture of high violence in certain cities, such as Patna and Lucknow.

Poverty, like urbanization, bears no significant association with murder rates; to the extent that there is any association, it is negative (that is, higher poverty levels are associated with lower murder rates). This goes against another common belief, namely that murder rates are particularly high among the poor. This view was quite influential among colonial administrators during the preindependence period.²¹ It is also a standard prediction of Becker’s model of crime, with its focus on the opportunity cost of time (Glaeser 1999). The poor, so goes the argument, have lower returns to legal activity and a lower opportunity cost of jail time, both of which raise the incentive to commit crimes. It is not difficult to see that this argument, on its own, is far from convincing in the Indian context. For one thing, poverty is associated not only with low wages but also with high levels of

TABLE 3 Regression coefficients showing the relationship of murder rates to independent variables

Dependent variable:	MURDER	MURDER	MURDER-PM ^a	MURDER	MURDER
Estimation method:	OLS	OLS	OLS	IV	OLS
Independent variables					
Constant	173.09	43.07	198.86	141.46	169.70
Literacy rate (LITERACY)	-.28** (-2.65)	-.50** (-4.65)	-.28** (-2.56)	-.33** (-2.62)	-.20* (-1.82)
Level of urbanization (URBAN)	-.10 (-1.07)	.21** (2.46)	-.12 (-1.23)	-0.02 (-0.17)	-0.06 (-.59)
Sen index of poverty (POVERTY)	-.13 (-.85)	-.36** (-2.32)	-.13 (-.81)	-.19 (-1.08)	-.08 (-.52)
Scheduled castes' population share (SC)	.20 (1.06)	.51** (2.68)	.20 (1.04)	.27 (1.27)	.24 (1.31)
Scheduled tribes' population share (ST)	.26** (2.92)	.26** (2.72)	.26** (2.70)	.26** (2.74)	.33** (3.53)
Female-male ratio (FMR)	-.14** (-6.88)	—	-0.16** (-7.74)	-.11** (-2.42)	-.11** (-4.51)
Ratio of male to female child mortality (Q5RATIO)	—	—	—	—	-31.69** (-2.21)
R ²	0.27	0.16	0.30	0.17	0.28
Number of observations	319	319	319	319	319

*significant at 10 percent level (*t*-ratio in parentheses); **significant at 1 percent level.

^aMurders per million males (multiplied by two, to facilitate comparison with other columns).

NOTES: OLS = ordinary least squares. IV = instrumental-variable estimation.

risk aversion. For another, the risk of being caught and convicted in the event of committing a murder tends to be much higher among the poor than among the rich. Indeed, the Indian judicial system is anything but impartial between different classes. While it is not uncommon for a privileged and influential person to “get away with murder,” the poor live in terror of the police and the courts.

These findings pertaining to development-related variables are broadly consistent with those of Bhatnagar (1990). Among the various socioeconomic variables and development indicators examined by the author (pp. 59–67), none showed a statistically significant correlation with murder rates at the state level. The author also found a negative (though not statistically significant) relationship between literacy and all types of crime, with the notable exception of “cheating.”

The baseline regression also indicates that districts with a higher proportion of scheduled-caste or scheduled-tribe persons in the population have higher murder rates (in the case of scheduled tribes, this association is statistically significant). It is tempting to conclude that these sections of society have a higher propensity to kill their fellow human beings, but this does not necessarily follow. At least two alternative explanations are possible. First, members of these social groups may be special targets of criminal violence. Indeed, they are “soft” targets, with a limited ability to retaliate or take legal action. Second, it is possible that a significant proportion of murders arise from caste or communal conflicts, and that such conflicts are particularly likely in areas where disadvantaged groups account for a larger share of the population. While these explanations may seem unconvincing in light of the fact that the social distance between offender and victim appears to be quite small in many cases, available evidence on the social background of offenders and victims is too scant to rule out these explanations.

The strongest pattern emerging from the baseline regression pertains to the female–male ratio, which is negatively correlated with the murder rate (i.e., murder rates are higher in districts with low female–male ratios). This correlation is very robust: no matter which other variables are included or excluded from the regression, we found that the female–male ratio remained highly significant, always with a negative sign.²² Further, the size of the coefficient of the female–male ratio is quite large: it implies, for instance, that the “predicted” murder rate for a district with Kerala’s female–male ratio (holding other independent variables at the mean) is only about half as large as the predicted murder rate for a district with, say, Uttar Pradesh’s female–male ratio.

The second column of Table 3 shows what happens if the female–male ratio is dropped from the regression. The main difference vis-à-vis the baseline regression is that urbanization is statistically significant, with a positive sign (i.e., more-urbanized districts have higher murder rates). However, this regression equation is misspecified, since it omits a variable of crucial importance, namely the female–male ratio. Thus, while urbanization appears to have a positive effect on murder rates (Table 3, column 2), this effect is entirely “accounted for” by the higher masculinity of the population in the more-urbanized districts (Table 3, column 1). The more general lesson is that analyses of crime in India are likely to be seriously incomplete, perhaps even distorted, if they fail to take into account the gender dimension of the problem.

Gender and crime

Let us now consider some explanations for the negative coefficient of the female–male ratio in the baseline regression.

Demographic weights

The first explanation that comes to mind is a plain “arithmetic” one: since men are far more violent than women, populations with a higher proportion of men naturally have higher murder rates.²³ Closer scrutiny of the results, however, indicates that the observed association between female–male ratios and murder rates is mediated principally by variations in sex-specific murder rates, rather than by variations in the demographic weights (i.e., male and female population shares) used to aggregate these sex-specific murder rates to obtain the overall murder rate. Formally, the murder rate (the number of murders divided by the total population, say k for short) may be written as

$$k \equiv mk_m + (1 - m)k_f \quad (1)$$

where m is the proportion of men in the population, k_m is the “male murder rate” (i.e., number of murders committed by men divided by male population), and k_f is the female murder rate, similarly defined. Equation (1) substantiates the arithmetic explanation: if sex-specific murder rates do not vary across districts, the overall murder rate is bound to be negatively correlated with the female–male ratio as long as k_m is larger than k_f . If sex-specific murder rates vary across districts, a regression of k on the female–male ratio would still produce a negative coefficient as long as inter-district variations in sex-specific murder rates are uncorrelated with the female–male ratio. However, equation (1) also suggests an elasticity of k with respect to m of at most 1 in absolute value.²⁴ By contrast, using the baseline regression (Table 3, first column) and the identity

$$m \equiv 1 / \left(1 + \frac{f}{m} \right)$$

where f/m is the female–male ratio, we find that the implicit elasticity of k with respect to m is larger than 8 in absolute value. In other words, the estimated effect of the female–male ratio on the murder rate is much larger than we would expect from the arithmetic explanation alone.

To illustrate the point, consider the aforementioned contrast between Garhwal and Pilibhit in Uttar Pradesh. Since the proportion of males in the population is about 13 percent higher in Pilibhit than in Garhwal, we would expect the murder rate itself to be up to 13 percent higher in Pilibhit, based on the arithmetic explanation alone (i.e., assuming identical sex-specific murder rates in the two districts). In fact, the murder rate is about 35 times as high in Pilibhit (106 per million) as in Garhwal (2.9 per million); further, the baseline regression suggests that about one-third of this gap is accounted

for by the contrast in female–male ratios (0.85 in Pilibhit versus 1.08 in Garhwal).

To look at this issue from another angle, we can shift the focus from the murder rate to the number of murders per male, that is, the number of murders divided by the male population (MURDER-PM in Table 3). Note that when k_f is close to zero, as is the case in India, MURDER-PM is essentially the same as k_m . As the third column of Table 3 shows, the regression results are much the same when MURDER is replaced with MURDER-PM on the left-hand side, reinforcing the notion that the results are driven by variations in sex-specific murder rates (specifically, k_m) rather than variations in the demographic weights used in aggregating these sex-specific murder rates to obtain k . In fact, if sex-specific murder rates were independent of the female–male ratio, we would expect the latter to have a positive coefficient in this regression, bearing in mind the identity

$$\frac{\text{murders}}{\text{male population}} \equiv k_m + k_f \frac{f}{m} \quad (2)$$

(the latter follows from dividing both sides of (1) by m). Contrary to this prediction, the coefficient of the female–male ratio in the third regression presented in Table 3 is negative.

Violence-induced preference for males

Next, we turn to Oldenburg’s (1992) explanation for the negative bivariate correlation between murder rates and the female–male ratio in Uttar Pradesh. Oldenburg hypothesized that, in areas with high levels of violence, preference for male children is particularly strong, because sons are valued as a protection against violence as well as for the exercise of power: “[M]y hypothesis [is] that families in west central UP want (or need) more sons than families elsewhere because additional sons enhance their capacity to literally defend themselves or to exercise their power” (p. 2659). In this line of explanation, the direction of causation runs from violence to low female–male ratios, rather than the other way around.

Oldenburg’s hypothesis prompted an incisive rejoinder from Arup Mitra (1993), who argued that it gives too much weight to the “physical security” factor in fertility decisions: “protection from violence such as disputes with neighbours (leading to murders) is just one single component of the huge spectrum of social security the parents expect to derive from having more sons” (p. 67). This statement, however, merely challenges the idea that regional variations in female–male ratios might be primarily due to variations in levels of violence. Even if that it is not the case, Oldenburg’s hypothesis

may still have some merit in explaining the observed correlation between female–male ratios and murder rates.

To test this hypothesis, we turn from OLS estimation to a standard two-stage procedure, where the female labor force participation rate is used as an “instrumental variable” for the female–male ratio. More precisely, in the first stage the female–male ratio is regressed on the female labor force participation rate and the other independent variables listed in Table 3. In the second stage, we rerun the baseline regression (Table 3, first column), with the female–male ratio in each district being replaced by the predicted female–male ratio derived from the first-stage regression. Roughly speaking, this procedure amounts to using female labor force participation as an exogenous proxy for the female–male ratio.²⁵ If Oldenburg’s hypothesis were correct, and provided that the murder rate does not influence (and is not influenced by) the level of female labor force participation, we would expect the coefficient of FMR in the second-stage regression to be devoid of significance.²⁶ Instead, as the fourth column of Table 3 shows, the coefficient of FMR in this two-stage regression remains negative and statistically significant. The size of the coefficient is now smaller, as one would expect, but the reduction is not large. This suggests that the reverse causation effect, such as it may be, is not the driving force behind the observed association between the murder rate and the female–male ratio.²⁷

This leaves two possibilities. First, a direct causal link may run from the female–male ratio to the murder rate. Second, both variables may be jointly influenced by some other feature of the society, not captured by any of the variables included in the regression.²⁸

The notion of a direct causal influence of the female–male ratio on the murder rate (leading the latter to rise where there is a shortage of women) has some intuitive appeal, but is difficult to formalize. Various ideas can be invoked here: male competition for women; social stress associated with a shortage of women; the taming effect of female companionship on men; the violent tendencies of unmarried men; and so on. Effects of this type have indeed been plausibly invoked in specific contexts, such as the high incidence of criminal violence among Indian migrant laborers in the British Caribbean colonies.²⁹ In the latter case, however, a large proportion of murders (notably those described as “wife murders” by the colonial administration) were directly related to sexual matters. In general, it is not easy to specify how and why a shortage of women should translate into a large number of murders, many of which have no direct connection with sexual matters.

Violence and patriarchy

Turning to the second possibility, one line of argument is that low female–male ratios and high murder rates are simply two manifestations of a patri-

archal environment: patriarchal values and practices manifest themselves both in high levels of violence and in a strong preference for male children (leading, in turn, to low female–male ratios). In fact, one can argue that patriarchy, in the broad sense of the subjugation of women, is intrinsically based on violence or at least the threat of it. From this perspective, it is not surprising that areas of high violence are associated with sharp gender inequalities, of which low female–male ratios are one manifestation.

This reasoning would have particular force if regional variations in murder rates were largely driven by variations in the propensity to kill women. In this case, low female–male ratios (reflecting parental neglect of female children) and high murder rates (reflecting large numbers of murders of women) would simply be two manifestations of one phenomenon—violence against females. In the absence of information on the gender of murder victims, it is difficult to probe this hypothesis.

A related version of the argument focuses on the historical role of violence in the emergence of patriarchal norms and institutions. Marvin Harris (1993), among others, has stressed “the importance of warfare in shaping gender hierarchies”; specifically, the author notes that “wherever conditions favored the development of warfare among bands and villages, the political and domestic subordination of women increased” (p. 61).³⁰ It is possible that the history of warfare in specific parts of India, such as the Gangetic plain, has left a legacy both of continuing violence and of gender inequality and male preference. The so-called martial castes of North India, in particular, are notorious for their fiercely patriarchal culture and low female–male ratios.³¹ There is also some evidence (and not just from Hindi films) that they have high murder rates.³² While these communities represent a small section of the population, the fact that they are often seen as role models by large sections of Indian society (Srinivas 1989) gives them much social influence in some areas.

Another possible aspect of the nexus between violence and patriarchy relates to land ownership. In India, both regional contrasts and comparisons between communities suggest a close relation between gender inequality and landed property. For instance, female–male ratios tend to be particularly low among the property-owning castes (Miller 1981). Similarly, areas of densely populated fertile land, with a long history of settled agriculture and private land ownership (e.g., the western Gangetic plain), tend to be associated with low levels of female labor force participation, an emphasis on the joint family, patrilocal postmarital residence, the practice of dowry, and related patriarchal norms.³³ All these, in turn, lead to a devaluation of female children relative to male children, and low female–male ratios. These particular communities and regions are also likely to be prone to property-related conflicts and violence. Given that a substantial proportion of all murders are property-related, we might expect a negative association between female–male ratios and murder rates, mediated by property relations.

Sex-specific migration

Inter-district variations in female–male ratios have two main sources: (1) variations in the relative survival rates of boys and girls and (2) sex-specific migration. Thus, a district with a low female–male ratio may be characterized either by a sharp anti-female bias in child survival or by high levels of net male in-migration.³⁴ While the former may be seen as a symptom of patriarchy, the latter is an entirely different phenomenon. To distinguish between the two, the last column of Table 3 presents one more variant of the baseline regression, where the ratio of male to female child mortality (Q5RATIO) is included as an additional right-hand-side variable. The results are much the same as before, and, interestingly, both FMR and Q5RATIO are highly significant, with a negative sign. This suggests that a strong connection between female–male ratios and murder rates remains even after controlling for the “patriarchy effect” (captured by Q5RATIO). One possible reason for this is that male in-migration, like patriarchy, simultaneously reduces the female–male ratio and enhances the murder rate. The underlying causes of the latter effect remain speculative.

Concluding remarks

Three significant patterns emerge from the tentative analysis presented in this study. First, murder rates in India bear no significant relation to urbanization or poverty. Second, education appears to exercise a moderating influence on criminal violence. Third, the strongest correlate of the murder rate is the female–male ratio: districts with higher female–male ratios have lower murder rates.

The causal relationships underlying this connection between female–male ratios and murder rates call for further investigation. What seems clear is that there is a strong link of some kind between gender relations and criminal violence (not just violence against women, but violence in the society as a whole). Earlier studies of crime in India seem to have missed this essential link. Similarly, standard criminology textbooks pay little attention to the relation between gender and crime (except through the specific prism of “crime against women”). Yet, this issue may be crucial in understanding criminal violence in many societies.

We end with an important qualification, which also points to possibilities of further research. This study has taken a “static” view of crime, which relates murder rates to various district characteristics at a single point in time. The sociology of crime, however, suggests that the changes taking place in society may also have much influence on crime rates.³⁵ For instance, while there may be little relation between the level of urbanization and the murder rate at a given point in time, a high rate of growth of cities may be associated with a high murder rate in urban areas (and perhaps

even in rural areas). Similarly, the absence of a significant correlation between poverty and the murder rate in cross-sectional data does not preclude the possibility that economic recessions are associated with high levels of violent crime.³⁶ Given the ready availability of annual data on crime in India, there is much scope for further investigation of these dynamic effects.

Notes

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1 This approach is similar to that of the “cartographic school” of criminology, pioneered by Adolphe Quételet and others in the nineteenth century; on the history and contribution of the cartographic school, see Gibbons (1977): 131–133, and the literature cited therein.

2 The main qualification is that most cases of female infanticide are likely to be unrecorded. The findings of this study should be read in that light.

3 What counts as a murder is, of course, partly a matter of interpretation and social construction. In this study, which relies on official data, we are constrained to rely on the definition given by the Indian Penal Code. The Code states that murder is “an act of commission or omission by a person who has the knowledge and the intent that his act will cause death or such bodily injury as will result in the death of another” (Driver 1961: 154).

4 According to Jean-Claude Chesnais (1981), the combination of declining homicide rates and rising overall crime rates is a typical feature of economic development (p. 443).

5 The 1999 *Human Development Report* (UNDP 1999) presents some international data on “intentional homicides” (Table 23, pp. 221–224). Among 47 “medium human development” countries for which data are available, India ranks 30th in descending order of murder rate. In “high human development” countries, murder rates tend to be comparatively low. On these and related patterns, see also Fajnzylber, Lederman, and Loayza (1998).

6 See, e.g., *Crime in India 1995*, p. 51. For crimes other than murder, urban crime rates

do seem to be higher than rural crime rates in many cases (e.g., burglary and theft), even after generous adjustments for underreporting in rural areas; on this, see also Clinard and Abbott (1973): 17.

7 Useful studies include Kerawalla (1959), Driver (1961), Bayley (1963), Ahuja (1969), Unnathan and Ahuja (1988), Das and Chattopadhyay (1991), Dube (1996a, 1996b). There is also something to learn from studies pertaining to the preindependence period, despite major changes in the social context of crime in India; see, e.g., Edwardes (1924), Somerville (1931), Walsh (1929, 1930), Haikerwal (1934).

8 According to Edwardes (1924), “most of the murders committed in districts as widely separated as the Panjab, Bombay, and Burma” relate to these “three powerful stimuli” (p. 18). The source of this information, however, is not clear from the text.

9 See, e.g., Driver (1961): Table 4, and Unnathan and Ahuja (1988): 65. *Crime in India 1995* includes a table on “motives of murder” (pp. 290–291). The percentage distribution, based on 37,464 murders committed in 1995 throughout India, is as follows: “personal vendetta or enmity,” 15.2 percent; “property dispute,” 10.6 percent; “love affairs and sexual causes,” 6.7 percent; “gain,” 4.7 percent; “dowry,” 2.2 percent; “class conflict,” 0.6 percent; “lunacy,” 0.3 percent; “casteism,” 0.3 percent; “communalism,” 0.3 percent; “other motives,” 59.1 percent. Obviously, the large share of the residual category “other motives” (which presumably includes all cases where no specific motive was identified) makes it difficult to interpret these figures.

10 In the case of murders committed by women, the association between offender and victim is even closer. In a study of 77 murders in Rajasthan and Punjab, Ahuja (1969) found that “in 61 cases, the victim was a member of

the offender's family" (p. 123); in 42 cases, the victim was the offender's husband.

11 See also Venugopala Rao (1981, 1988a, 1988b), Bhatnagar (1990), Subramanian (1992) for related analyses of violent crime in India.

12 In a similar vein, Glaeser (1999) notes that in the United States "there is a very high positive correlation between the number of police per capita and the amount of crime per capita" (p. 11), most likely because the latter affects the former.

13 Bhatnagar (1990: 69) argues that in India "increasing level of socio-economic development...is inversely related to the volume of crimes." However, this conclusion receives only weak support from his own statistical analysis. The latter, like Nayar's, is based on cross-sectional regressions at the state level, with only 20 observations.

14 There have been few attempts to develop formal analyses of the causes of crime in developing countries; for a useful introduction, see Glaeser (1999).

15 The motivation for this choice of reference year is the availability of a wide range of district-level data from the 1981 census. A similar analysis based on 1991 census data (combined with the 1981 data) is in progress.

16 Another area of exceptionally low murder rates is the hill region of northern India, consisting of Jammu and Kashmir, Himachal Pradesh, and Uttarakhand (the hill districts of Uttar Pradesh). The states of Jammu and Kashmir and Himachal Pradesh are not included in our analysis, for lack of relevant data. In Jammu and Kashmir, there is some evidence of a sharp increase in murder rates in the 1990s, possibly associated with rising political violence in the state; see, e.g., *Crime in India 1995*, p. 51.

17 Strictly speaking, unbiased estimation only requires intraregional variations in poverty levels to be uncorrelated with the right-hand-side variables in the regression equations.

18 The Gini coefficient, like the poverty index, is available as a region-level variable for 1972-73. This is likely to be a poor indicator of "trend" levels of economic inequality around 1981, as the Gini coefficient varies a great deal from year to year (see Drèze and Srinivasan 1996). It is possible that a better index of economic inequality would have more explana-

tory power. Fajnzylber, Lederman, and Loayza (1998) find a strong positive association between inequality and violent crime in international data; on this issue, see also Hsieh and Pugh (1993) and Kennedy et al. (1998) and the literature cited therein.

19 In Chesnais's (1981: 409) assessment, the progress of elementary education was the major force behind the secular decline of criminal violence in Europe during the nineteenth and twentieth centuries. As the author eloquently puts it: "Echec du dialogue, la violence commence là où s'arrête le pouvoir du verbe" (violence is a failure of dialogue, which begins where the power of the word ends). Also relevant here are recent surveys in the United Kingdom and the United States indicating exceptionally high rates of dyslexia among offenders: around 50 percent, compared with 4 to 20 percent in the general population (Klein 1998). Fajnzylber, Lederman, and Loayza (1998), however, find no significant association between criminal violence and literacy in international cross-sectional data. This "crime-education puzzle," as the authors call it, may be due to higher reporting rates in countries with higher educational levels.

20 Urbanization presumably enhances the incidence of greed-motivated murders (e.g., those linked with burglary); as things stand, however, such murders appear to be quite rare in India.

21 On this point, see Kerawalla (1959): 19-20. It is possible, of course, that this view had greater credibility at that time than it has today.

22 Preliminary analysis of 1991 data generates the same pattern (and also supports our 1981 results in other respects).

23 There is ample evidence that most murders in India are committed by men; see, e.g., *Crime in India 1995*, p. 147. This is, in fact, a worldwide pattern; see Chesnais (1981) and Spierenburg (1998).

24 To see this, note first that for given k_m , the elasticity of k with respect to m is largest when k_f is zero. In that case, $k \equiv mk_m$ and the elasticity in question is 1.

25 The two variables are highly correlated, mainly because female labor force participation has a strong (positive) influence on the female-male ratio. This influence seems to

work mainly through differential survival rates of boys and girls: boy preference is particularly strong in areas with low rates of female labor force participation. See, e.g., Rosenzweig and Schultz (1982), Kishor (1993), Murthi, Guio, and Drèze (1995).

26 The possibility of a direct interaction between female labor force participation and the murder rate cannot be ruled out. In particular, high levels of violence may deter women from working outside the household. As an alternative, we also tried using the 1901 female–male ratio as an instrumental variable; the results are very similar.

27 A Hausman–Wu test rejects the hypothesis of exogeneity of the female–male ratio. This suggests that Oldenburg’s hypothesis does have some merit, even though it explains only a small part of the observed association between murder rates and female–male ratios.

28 Strictly speaking, female labor force participation also has to be influenced by the unobserved variable; otherwise this hypothesis would fail to explain why the coefficient of FMR remains significant in the IV regression.

29 For an extensive discussion and critique of the arguments, see Mohapatra (1995). One referee suggests that this line of analysis also applies to the nineteenth-century “wild West” in America, and adds that “young males in the absence of female companions are apt to get into a very bad mood.”

30 Harris (1993) makes an important distinction between internal warfare and external warfare with distant enemies. The latter type of warfare “enhances rather than worsens the status of women since it results in avunculocal or matrilineal domestic organizations” (p. 66). The author gives the example of the matrilineal Iroquois, but the observation is also relevant to the Nairs of Kerala (who, like the Iroquois, have a history of distant warfare as well as of matriliney).

31 See Drèze and Gazdar (1997): 105–107 and the literature cited therein.

32 In a study of the village of Palanpur (western Uttar Pradesh) spanning five decades, Drèze and Sharma (1998) note that most murders over this period were committed by Thakurs. The authors also mention various other indicators of the continuing influence of militaristic values among the Thakurs: they have the monopoly of guns in the village, spend time in body-building, strive to get jobs in the army and the police, etc.

33 These associations need not apply if land inheritance is matrilineal; this is one possible reason why they have limited relevance in Kerala, which has a tradition of matrilineal inheritance for a substantial section of the population.

34 Female migration can be plausibly overlooked here. Women do “migrate” at the time of marriage (from their natal home village to their husband’s village), but this is unlikely to have a major effect on district-specific female–male ratios; the same applies to postmarital female migration, since married women in India rarely migrate without their families. Similarly, the female–male ratio at birth is unlikely to vary significantly between different regions, though this may have changed in recent years with the spread of sex-selective induced abortion.

35 See, e.g., Robert Merton’s (1938, 1957) “strain” theory of crime, which builds on Emile Durkheim’s (1951 [1897]) notion of *anomie* (“normlessness”), most likely to prevail at times of rapid social change. Various other sociological theories of crime also involve an explicit or implicit focus on the pace of social change.

36 A strong argument in this direction (for the preindependence period) is presented in Haikerwal (1934).

References

- Ahuja, Ram. 1969. *Female Offenders in India*. Meerut: Meenakshi Prakashan.
- Bayley, David H. 1963. “Violent public protest in India: 1900–1960,” *The Indian Journal of Political Science* 24.
- . 1969. *The Police and Political Development in India*. Princeton: Princeton University Press.

- Bhatnagar, R. R. 1990. *Crimes in India: Problems and Policy*. New Delhi: Ashish Publishing House.
- Chesnais, Jean-Claude. 1981. *Histoire de la violence en Occident de 1800 à nos jours*. Paris: Laffont.
- Clinard, M. B. and D. J. Abbott. 1973. *Crime in Developing Countries: A Comparative Perspective*. New York: Wiley & Sons.
- Das, S. and B. Chattopadhyay. 1991. "Rural crime in police perception: A study of village crime notebooks," *Economic and Political Weekly* 19 January: 129–135.
- Deaton, Angus. 1997. *The Analysis of Household Surveys: A Microeconomic Approach to Development Policy*. Baltimore: Johns Hopkins University Press.
- Drèze, Jean and P. V. Srinivasan. 1996. "Poverty in India: Regional estimates, 1987–8," Discussion Paper No. 70, Development Economics Research Programme, London School of Economics; forthcoming in *Journal of Quantitative Economics*.
- Drèze, Jean and Haris Gazdar. 1997. "Uttar Pradesh: The burden of inertia," in J. Drèze and A. K. Sen (eds.), *Indian Development: Selected Regional Perspectives*. Oxford and New Delhi: Oxford University Press.
- Drèze, Jean and Naresh Sharma. 1998. "Palanpur: Population, society, economy," in P. Lanjouw and N. H. Stern (eds.), *Economic Development in Palanpur over Five Decades*. Oxford and New Delhi: Oxford University Press.
- Driver, Edwin D. 1961. "Interaction and criminal homicide in India," *Social Forces* 40.
- Dube, Saurabh. 1996a. "Telling tales and trying truths: Transgressions, entitlements and legalities in village disputes, late colonial central India," *Studies in History* 12(2): 171–201.
- . 1996b. "Village disputes and colonial law: Two cases from Chattisgarh," in N. Jayaram and S. Saberwal (eds.), *Social Conflict*. Delhi: Oxford University Press.
- Durkheim, Emile. 1951 [1897]. *Suicide: A Study in Sociology*, translated by J. Spaulding and G. Simpson. Glencoe, IL: Free Press.
- Edwardes, S. M. 1924. *Crime in India*, reprinted 1988. Jaipur: Printwell Publishers.
- Fajnzylber, P., D. Lederman, and N. Loayza. 1998. "What causes violent crime?" mimeo, World Bank, Washington, DC.
- Gibbons, Don C. 1977. *Society, Crime, and Criminal Careers: An Introduction to Criminology*. Englewood Cliffs, NJ: Prentice-Hall.
- Glaeser, Edward L. 1999. "An overview of crime and punishment," mimeo, National Bureau of Economic Research, Cambridge, MA.
- Government of India (annual). *Crime in India*. New Delhi: Ministry of Home Affairs.
- . 1988. "Child mortality estimates of India," Occasional Papers, No. 5 of 1988, Demography Division, Office of the Registrar General, New Delhi.
- Haikerwal, Bejoy Shanker. 1934. *Economic and Social Aspects of Crime in India*. London: Allen & Unwin.
- Harris, Marvin. 1993. "The evolution of human gender hierarchies: A trial formulation," in B. D. Miller (ed.), *Sex and Gender Hierarchies*. Cambridge: Cambridge University Press.
- Hsieh, C. and M. D. Pugh. 1993. "Poverty, income inequality, and violent crime: A meta-analysis of recent aggregate data studies," *Criminal Justice Review* 18.
- Jain, L. R., K. Sundaram, and S. D. Tendulkar. 1988. "Dimensions of rural poverty: An inter-regional profile," *Economic and Political Weekly*, November (43–45): 2395–2408.
- Kennedy, B. P. et al. 1998. "Social capital, income inequality, and firearm violent crime," *Social Science and Medicine* 47: 7–17.
- Kerawalla, Perin C. 1959. *A Study in Indian Crime*. Bombay: Popular Book Depot.
- Kishor, Sunita. 1993. "'May God give sons to all': Gender and child mortality in India," *American Sociological Review* 58: 247–265.
- Klein, Cynthia. 1998. *Dyslexia and Offending: Intervention for Change*. London: Dyspel Project.
- Merton, Robert K. 1938. "Social structure and anomie," *American Sociological Review* 3.
- . 1957. *Social Theory and Social Structure*. New York: Free Press.
- Miller, Barbara D. 1981. *The Endangered Sex: Neglect of Female Children in Rural North India*. Ithaca: Cornell University Press.

- Mitra, Arup. 1993. "Sex ratio and violence: Spurious results," *Economic and Political Weekly* 2-9 January: 67.
- Mohapatra, Prabhu. 1995. "'Restoring the family': Wife murders and the making of a sexual contract for Indian immigrant labour in the British Caribbean colonies, 1860-1920," *Studies in History* 11 (2): 227-260.
- Murthi, M., A-C. Guio, and J. Drèze. 1995. "Mortality, fertility, and gender bias in India: A district-level analysis," *Population and Development Review* 21: 745-782.
- Nayar, Baldev Raj. 1975. *Violence and Crime in India: A Quantitative Study*. Delhi: Macmillan.
- Oldenburg, Philip. 1992. "Sex ratio, son preference and violence in India: A research note," *Economic and Political Weekly* 5-12 December: 2657-2662.
- Rogers, John D. 1989. "Theories of crime and development: An historical perspective," *Journal of Development Studies* 25: 314-328.
- Rosenzweig, M. R. and T. P. Schultz. 1982. "Market opportunities, genetic endowments, and intrafamily resource distribution: Child survival in rural India," *American Economic Review* 72: 803-815.
- Sen, Amartya. 1985. *Commodities and Capabilities*. Amsterdam: North-Holland.
- Somerville, Augustus. 1931. *Crime and Religious Beliefs in India*. Calcutta: "The Criminologist."
- Spierenburg, Petrus. 1998. *Men and Violence: Gender, Honor, and Rituals in Modern Europe and America*. Ohio: Ohio State University Press.
- Srinivas, M. N. 1989. *The Cohesive Role of Sanskritization and Other Essays*. Delhi: Oxford University Press.
- Subramanian, K. S. 1992. "Political violence, social movements and the state in India," Discussion Paper 308, Institute of Development Studies, University of Sussex.
- UNDP (United Nations Development Programme). 1999. *Human Development Report 1999*. New York: Oxford University Press.
- Unnathan, T. K. N. and Ram Ahuja. 1988. "Sub-culture of violence: The Indian context," in Venugopala Rao (1988a).
- Venugopala Rao, S. 1981. *Dynamics of Crime: Spatial and Socio-economic Aspects of Crime in India*. New Delhi: Indian Institute of Public Administration.
- (ed.). 1988a. *Perspectives in Criminology*. Delhi: Vikas.
- . 1988b. "Contemporary trends of crime," in Venugopala Rao (1988a).
- Walsh, Cecil. 1929. *Indian Village Crimes: With an Introduction on Police Investigation and Confessions*. London: Ernest Benn.
- . 1930. *Crime in India: With an Introduction on Forensic Difficulties and Peculiarities*. London: Ernest Benn.

Leta S. Hollingworth on Coercive Pronatalism

In the late 1960s, with the decisive ending of the baby boom not fully apparent, the US Commission on Population Growth and the American Future was pondering whether America needed to adopt an antinatalist policy. Judith Blake, in a background paper for the Commission, argued that such a debate was premature: US society, she asserted, was pervaded by time-honored pronatalist pressures; free choice in fertility did not exist. "People make their 'voluntary' reproductive choices in an institutional context that severely constrains them not to remain single, not to choose childlessness, not to bear only one child, and even not to limit themselves to two children." Her term for that situation was coercive pronatalism. A first step toward reducing population growth, if that was sought, should entail eliminating those constraints, making possible "a fuller expression of human individuality and diversity." (See Volume VI of the Commission's research reports, Washington DC, 1972.)

The article reprinted below, by Leta Stetter Hollingworth, is in many respects an anticipation of such arguments. It is titled "Social devices for impelling women to bear and rear children," and appeared in American Journal of Sociology, Volume 22, No. 1, July 1916. The author sets out to illustrate "just how the various social institutions have been brought to bear on women" so as to sustain a birth rate sufficient "to offset the wastage of war and disease." The perceived fertility problem then, much like now but unlike the 1960s, was how to maintain population replacement in the face of individual interests preferring small families or even childlessness. US total fertility early in the twentieth century was around 3, and had been slowly declining for decades; Europe was experiencing the decimation of its youth in World War I.

A separate, familial role for women found popular justification in the idea of a maternal instinct. Hollingworth gives scant credence to such an instinct. To her it is a doctrine used in the service of social control, though she concedes a "natural desire for children" that may put a low-level floor under fertility. For most subsequent researchers, biology has played almost no part in reproductive motivation. In

this issue of PDR, however, Caroline Foster argues for a partial restoration of biological influence in the form of a non-sex-specific nurturing instinct.

Hollingworth was a major figure in American psychology and education in the 1920s and 1930s and a scholar with broad feminist interests. She was born Leta Stetter near Chadron, Nebraska, in 1886. After studying English literature at the University of Nebraska, she moved to New York with her husband, Harry L. Hollingworth, then a graduate student. When finances permitted, she pursued part-time graduate work at Teachers College, Columbia University, where she received her Ph.D. in educational psychology in 1916 and where, after a short period as a clinical psychologist, she remained as a faculty member for the rest of her life. Her early research challenged prevailing beliefs about the biological bases of gender differences in achievement—for example, the theory that women's abilities were more narrowly distributed than men's. Later, her research interests turned to child development—in particular, adolescence and the development and education of gifted and exceptionally gifted ($IQ > 180$) children. In these areas she had strong and lasting influence, her books being regarded as classics. She died of cancer in 1939, aged 53. She was survived by her husband, also a psychologist, who wrote a memoir of her: *Leta Stetter Hollingworth: A Biography* (University of Nebraska Press, 1943; Anker, Boston, 1990).

The article reprinted here was among her earliest publications, appearing the year she received her Ph.D. It is an almost casual piece, exhibiting her easy, limpid style and light touch, backed by a very sharp mind. She takes a textbook treatment of social control and a passing remark by its author and elaborates them into a cogent and witty analysis of the sociology of fertility.

“Again the breeding function of the family would be better discharged if public opinion and religion conspired, as they have until recently, to crush the aspirations of woman for a life of her own. But the gain would not be worth the price.”—E. A. Ross, *Social Control* (1904).

In this quotation from Ross we have suggested to us an exceedingly important and interesting phase of social control, namely, the control by those in social power over those individuals who alone can bring forth the human young, and thus perpetuate society. It is necessary that at the very outset of this discussion we should consent to clear our minds of the sentimental conception of motherhood and to look at facts. Sumner¹ states these facts as well as they have ever been stated, in his consideration of the natural burdens of society. He says:

¹W. G. Sumner, *Folkways*, 1906.

Children add to the weight of the struggle for existence of their parents. The relation of parent to child is one of sacrifice. The interests of parents and children are antagonistic. The fact that there are or may be compensations does not affect the primary relation between the two. It may well be believed that, if procreation had not been put under the dominion of a great passion, it would have been caused to cease by the burdens it entails.

This is especially true in the case of the mothers.

The fact is that child-bearing is in many respects analogous to the work of soldiers: it is necessary for tribal or national existence; it means great sacrifice of personal advantage; it involves danger and suffering, and, in a certain percentage of cases, the actual loss of life. Thus we should expect that there would be a continuous social effort to insure the group-interest in respect to population, just as there is a continuous social effort to insure the defense of the nation in time of war. It is clear, indeed, that the social devices employed to get children born, and to get soldiers slain, are in many respects similar.

But once the young are brought into the world they still must be reared, if society's ends are to be served, and there again the need for and exercise of social control may be seen. Since the period of helpless infancy is very prolonged in the human species, and since the care of infants is an onerous and exacting labor, it would be natural for all persons not biologically attached to infants to use all possible devices for fastening the whole burden of infant-tending upon those who are so attached. We should expect this to happen, and we shall see, in fact, that there has been consistent social effort to establish as a norm the woman whose vocational proclivities are completely and "naturally" satisfied by child-bearing and child-rearing, with the related domestic activities.

There is, to be sure, a strong and fervid insistence on the "maternal instinct," which is popularly supposed to characterize all women equally, and to furnish them with an all-consuming desire for parenthood, regardless of the personal pain, sacrifice, and disadvantage involved. In the absence of all verifiable data, however, it is only common-sense to guard against accepting as a fact of human nature a doctrine which we might well expect to find in use as a means of social control. Since we possess no scientific data at all on this phase of human psychology, the most reasonable assumption is that if it were possible to obtain a quantitative measurement of maternal instinct, we should find this trait distributed among women, just as we have found all other traits distributed which have yielded to quantitative measurement. It is most reasonable to assume that we should obtain a curve of distribution, varying from an extreme where individuals have a zero or negative interest in caring for infants, through a mode where there is a moderate amount of impulse to such duties, to an extreme where the only vocational or personal interest lies in maternal activities.

The facts, shorn of sentiment, then, are: (1) The bearing and rearing of children is necessary for tribal or national existence and aggrandizement. (2) The bearing and rearing of children is painful, dangerous to life, and involves long years of exacting labor and self-sacrifice. (3) There is no verifiable evidence to show that a maternal instinct exists in women of such all-consuming strength and fervor as to impel them voluntarily to seek the pain, danger, and exacting labor involved in maintaining a high birth rate.

We should expect, therefore, that those in control of society would invent and employ devices for impelling women to maintain a birth rate sufficient to insure enough increase in the population to offset the wastage of war and disease. It is the purpose of this paper to cite specific illustrations to show just how the various social institutions have been brought to bear on women to this end. Ross has classified the means which society takes and has taken to secure order, and insure that individuals will act in such a way as to promote the interests of the group, *as those interests are conceived by those who form "the radiant points of social control."* These means, according to the analysis of Ross, are public opinion, law, belief, social suggestion, education, custom, social religion, personal ideals (the type), art, personality, enlightenment, illusion, and social valuation. Let us see how some of these means have been applied in the control of women.

Personal ideals (the type).—The first means of control to which I wish to call attention in the present connection is that which Ross calls "personal ideals." It is pointed out that "a developed society presents itself as a system of unlike individuals, strenuously pursuing their personal ends." Now, for each person there is a "certain zone of requirement," and since "altruism is quite incompetent to hold each unswervingly to the particular activities and forbearances belonging to his place in the social system," the development of such allegiance must be—

effected by means of types or patterns, which society induces its members to adopt as their guiding ideals.... To this end are elaborated various patterns of conduct and of character, which may be termed social types. These types may become in the course of time personal ideals, each for that category of persons for which it is intended.

For women, obviously enough, the first and most primitive "zone of requirement" is and has been to produce and rear families large enough to admit of national warfare being carried on, and of colonization.

Thus has been evolved the social type of the "womanly woman," "the normal woman," the chief criterion of normality being a willingness to engage enthusiastically in maternal and allied activities. All those classes and professions which form "the radiant points of social control" unite upon this criterion. Men of science announce it with calm assurance (though

failing to say on what kind or amount of scientific data they base their remarks). For instance, McDougall² writes:

The highest stage is reached by those species in which each female produces at birth but one or two young, and protects them so efficiently that most of the young born reach maturity; the maintenance of the species thus becomes in the main the work of the parental instinct. In such species the protection and cherishing of the young is the constant and all-absorbing occupation of the mother, to which she devotes all her energies, and in the course of which she will at any time undergo privation, pain, and death. The instinct (maternal instinct) becomes more powerful than any other, and can override any other, even fear itself.

Professor Jastrow³ writes:

.... *charm* is the technique of the maiden, and *sacrifice* the passion of the mother. One set of feminine interests expresses more distinctly the issues of courtship and attraction; the other the qualities of motherhood and devotion.

The medical profession insistently proclaims desire for numerous children as the criterion of normality for women, scornfully branding those so ill-advised as to deny such desires as "abnormal." As one example among thousands of such attempts at social control let me quote the following, which appeared in a New York newspaper on November 29, 1915:

Only abnormal women want no babies. Trenchant criticism of modern life was made by Dr. Max G. Schlapp, internationally known as a neurologist. Dr. Schlapp addressed his remarks to the congregation of the Park Avenue M.E. Church. He said, "The birth rate is falling off. Rich people are the ones who have no children, and the poor have the greatest number of offspring. Any woman who does not desire offspring is abnormal. We have a large number, particularly among the women, who do not want children. Our social society is becoming intensely unstable."

And this from the *New York Times*, September 5, 1915:

Normally woman lives through her children; man lives through his work.

Scores of such implicit attempts to determine and present the type or norm meet us on every hand. This norm has the sanction of authority,

²W. McDougall, *Social Psychology*, 1908.

³J. Jastrow, *Character and Temperament*, 1915.

being announced by men of greatest prestige in the community. No one wishes to be regarded by her fellow-creatures as "abnormal" or "decayed." The stream of suggestions playing from all points inevitably has its influence, so that it is or was, until recently, well-nigh impossible to find a married woman who would admit any conflicting interests equal or paramount to the interest of caring for children. There is a universal refusal to admit that the maternal instinct, like every other trait of human nature, might be distributed according to the probability curve.

Public opinion.—Let us turn next to public opinion as a means of control over women in relation to the birth rate. In speaking of public opinion Ross says:

Haman is at the mercy of Mordecai. Rarely can one regard his deed as fair when others find it foul, or count himself a hero when the world deems him a wretch.... For the mass of men the blame and the praise of the community are the very lords of life.

If we inquire now what are the organs or media of expression of public opinion we shall see how it is brought to bear on women. The newspapers are perhaps the chief agents, in modern times, in the formation of public opinion, and their columns abound in interviews with the eminent, deploring the decay of the population. Magazines print articles based on statistics of depopulation, appealing to the patriotism of women. In the year just passed fifty-five articles on the birth rate have chanced to come to the notice of the present writer. Fifty-four were written by men, including editors, statesmen, educators, ex-presidents, etc. Only one was written by a woman. The following quotation is illustrative of the trend of all of them:

M. Emil Reymond has made this melancholy announcement in the Senate: "We are living in an age when women have pronounced upon themselves a judgment that is dangerous in the highest degree to the development of the population..... We have the right to do what we will with the life that is in us, say they."

Thus the desire for the development of interests and aptitudes other than the maternal is stigmatized as "dangerous," "melancholy," "degrading," "abnormal," "indicative of decay." On the other hand, excessive maternity receives many cheap but effective rewards. For example, the Jesuit priests hold special meetings to laud maternity. The German Kaiser announces that he will now be godfather to seventh, eighth, and ninth sons, even if daughters intervene. The ex-President has written a letter of congratulation to the mother of nine.

Law.—Since its beginning as a human institution law has been a powerful instrument for the control of women. The subjection of women was originally an irrational consequence of sex differences in reproductive function. It was not *intended* by either men or women, but simply resulted from the natural physiological handicaps of women, and the attempts of humanity to adapt itself to physiological nature through the crude methods of trial and error. When law was formulated, this subjection was defined, and thus furthered. It would take too long to cite all the legal provisions that contribute, indirectly, to keep women from developing individualistic interests and capacities. Among the most important indirect forces in law which affect women to keep them child-bearers and child-rearers only are those provisions that tend to restrain them from possessing and controlling property. Such provisions have made of women a comparatively possessionless class, and have thus deprived them of the fundamentals of power. While affirming the essential nature of woman to be satisfied with maternity and with maternal duties only, society has always taken every precaution to close the avenues to ways of escape therefrom.

Two legal provisions which bear directly on women to compel them to keep up the birth rate may be mentioned here. The first of these is the provision whereby sterility in the wife may be made a cause of divorce. This would be a powerful inducement to women who loved their husbands to bear children if they could. The second provision is that which forbids the communication of the data of science in the matter of the means of birth control. The American laws are very drastic on this point. Recently in New York City a man was sentenced to prison for violating this law. The more advanced democratic nations have ceased to practice military conscription. They no longer conscript their men to bear arms, depending on the volunteer army. But they conscript their women to bear children by legally prohibiting the publication or communication of the knowledge which would make child-bearing voluntary.

Child-rearing is also legally insured by those provisions which forbid and punish abortion, infanticide, and infant desertion. There could be no better proof of the insufficiency of maternal instinct as a guaranty of population than the drastic laws which we have against birth control, abortion, infanticide, and infant desertion.

Belief.—Belief, "which controls the hidden portions of life," has been used powerfully in the interests of population. Orthodox women, for example, regard family limitation as a sin, punishable in the hereafter. Few explicit exhortations concerning the birth rate are discoverable in the various "Words" of God. The belief that family limitation will be punished in the hereafter seems to have been evolved mainly by priests out of the slender materials of a few quotations from Holy Writ, such as "God said unto them, 'Multiply and replenish the earth,'" and from the scriptural allusion

to children as the gifts of God. Being gifts from God, it follows that they may not be refused except at the peril of incurring God's displeasure.

Education.—The education of women has always, until the end of the nineteenth century, been limited to such matters as would become a creature who could and should have no aspirations for a life of her own. We find the proper education for girls outlined in the writings of such educators as Rousseau, Fénelon, St. Jerome, and in Godey's *Lady's Book*. Not only have the "social guardians" used education as a negative means of control, by failing to provide any real enlightenment for women, but education has been made a positive instrument for control. This was accomplished by drilling into the young and unformed mind, while yet it was too immature to reason independently, such facts and notions as would give the girl a conception of herself only as future wife and mother. Rousseau, for instance, demanded freedom and individual liberty of development for everybody except Sophia, who was to be deliberately trained up as a means to an end. In the latter half of the nineteenth century when the hard battle for the real enlightenment of women was being fought, one of the most frequently recurring objections to admitting women to knowledge was that "the population would suffer," "the essential nature of woman would be changed," "the family would decay," and "the birth rate would fall." Those in control of society yielded up the old prescribed education of women only after a stubborn struggle, realizing that with the passing of the old training an important means of social control was slipping out of their hands.

Art.—A very long paper might be written to describe the various uses to which art had been put in holding up the ideal of motherhood. The mother, with children at her breast, is the favorite theme of artists. The galleries of Europe are hung full of Madonnas of every age and degree. Poetry abounds in allusions to the sacredness and charm of motherhood, depicting the yearning of the adult for his mother's knee. Fiction is replete with happy and adoring mothers. Thousands of songs are written and sung concerning the ideal relation which exists between mother and child. In pursuing the mother-child theme through art one would not be led to suspect that society finds it necessary to make laws against contraception, infanticide, abortion, and infant desertion. Art holds up to view only the compensations of motherhood, leaving the other half of the theme in obscurity, and thus acting as a subtle ally of population.

Illusion.—This is the last of Ross's categories to which I wish to refer. Ross says:

In the taming of men there must be provided coil after coil to entangle the unruly one. Mankind must use snares as well as leading-strings, will-o-the-wisps as well as lanterns. The truth by all means, if it will promote obedience, but in any case obedience! We shall examine not creeds now, but the

films, veils, hidden mirrors, and half lights by which men are duped as to that which lies nearest them, their own experience. This time we shall see men led captive, not by dogmas concerning a world beyond experience, but by artfully fostered misconceptions of the pains, satisfactions, and values lying under their very noses.

One of the most effective ways of creating the desired illusion about any matter is by concealing and tabooing the mention of all the painful and disagreeable circumstances connected with it. Thus there is a very stern social taboo on conversation about the processes of birth. The utmost care is taken to conceal the agonies and risks of child-birth from the young. Announcement is rarely made of the true cause of deaths from child-birth. The statistics of maternal mortality have been neglected by departments of health, and the few compilations which have been made have not achieved any wide publicity or popular discussion. Says Katharine Anthony, in her recent book on *Feminism in Germany and Scandinavia* (1915):

There is no evidence that the death rate of women from child-birth has caused the governing classes many sleepless nights.

Anthony gives some statistics from Prussia (where the figures have been calculated), showing that

between 1891 and 1900 11 per cent of the deaths of all women between the ages of twenty-five and forty years occurred in child-birth..... During forty years of peace Germany lost 400,000 mothers' lives, that is, ten times what she lost in soldiers' lives in the campaign of 1870 and 1871.

Such facts would be of wide public interest, especially to women, yet there is no tendency at all to spread them broadcast or to make propaganda of them. Public attention is constantly being called to the statistics of infant mortality, but the statistics of maternal mortality are neglected and suppressed.

The pains, the dangers, and risks of child-bearing are tabooed as subjects of conversation. The drudgery, the monotonous labor, and other disagreeable features of child-rearing are minimized by "the social guardians." On the other hand, the joys and compensations of motherhood are magnified and presented to consciousness on every hand. Thus the tendency is to create an illusion whereby motherhood will appear to consist of compensations only, and thus come to be desired by those for whom the illusion is intended.

There is one further class of devices for controlling women that does not seem to fit any of the categories mentioned by Ross. I refer to threats

of evil consequence to those who refrain from child-bearing. This class of social devices I shall call "bugaboos." Medical men have done much to help population (and at the same time to increase obstetrical practice!) by inventing bugaboos. For example, it is frequently stated by medical men, and is quite generally believed by women, that if first child-birth is delayed until the age of thirty years the pains and dangers of the process will be very gravely increased, and that therefore women will find it advantageous to begin bearing children early in life. It is added that the younger the woman begins to bear the less suffering will be experienced. One looks in vain, however, for any objective evidence that such is the case. The statements appear to be founded on no array of facts whatever, and until they are so founded they lie under the suspicion of being merely devices for social control.

One also reads that women who bear children live longer on the average than those who do not, which is taken to mean that childbearing has a favorable influence on longevity. It may well be that women who bear many children live longer than those who do not, but the only implication probably is that those women who could not endure the strain of repeated births died young, and thus naturally did not have many children. The facts may indeed be as above stated, and yet child-bearing may be distinctly prejudicial to longevity.

A third bugaboo is that if a child is reared alone, without brothers and sisters, he will grow up selfish, egoistic, and an undesirable citizen. Figures are, however, so far lacking to show the disastrous consequences of being the only child.

From these brief instances it seems very clear that "the social guardians" have not really believed that maternal instinct is alone a sufficient guaranty of population. They have made use of all possible social devices to insure not only child-bearing, but child-rearing. Belief, law, public opinion, illusion, education, art, and bugaboos have all been used to re-enforce maternal instinct. We shall never know just how much maternal instinct alone will do for population until all the forces and influences exemplified above have become inoperative. As soon as women become fully conscious of the fact that they have been and are controlled by these devices the latter will become useless, and we shall get a truer measure of maternal feeling.

One who learns why society is urging him into the straight and narrow way will resist its pressure. One who sees clearly how he is controlled will thenceforth be emancipated. To betray the secrets of ascendancy is to forearm the individual in his struggle with society.

The time is coming, and is indeed almost at hand, when all the most intelligent women of the community, who are the most desirable child-

bearers, will become conscious of the methods of social control. The type of normality will be questioned; the laws will be repealed and changed; enlightenment will prevail; belief will be seen to rest upon dogmas; illusion will fade away and give place to clearness of view; the bugaboos will lose their power to frighten. How will "the social guardians" induce women to bear a surplus population when all these cheap, effective methods no longer work?

The natural desire for children may, and probably will, always guarantee a stationary population, even if child-bearing should become a voluntary matter. But if a surplus population is desired for national aggrandizement, it would seem that there will remain but one effective social device whereby this can be secured, namely, *adequate compensation*, either in money or in fame. If it were possible to become rich or famous by bearing numerous fine children, many a woman would no doubt be eager to bring up eight or ten, though if acting at the dictation of maternal instinct only, she would have brought up but one or two. When the cheap devices no longer work, we shall expect expensive devices to replace them, if the same result is still desired by the governors of society.

If these matters could be clearly raised to consciousness, so that this aspect of human life could be managed rationally, instead of irrationally as at present, the social gain would be enormous—assuming always that the increased happiness and usefulness of women would, in general, be regarded as social gain.

The Predicament of Population Aging: A Review Essay*

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Faites de l'épargne plutôt que les enfants, advised the great eighteenth-century economist Jean-Baptiste Say, revealing his Malthusian stripes. Now along comes Peter Peterson, who says the global aging situation is so dire that we had better start saving more *and* having more children—the sooner the better.

I picked up Peterson's *Gray Dawn* with trepidation. Like other apparently looming challenges to the human condition (climate change, for example), population aging can exert a fatal attraction for people who have a solution looking for a problem. The problem, or should I say the meta-problem, is that "the aging problem" is complex, multifaceted, and ill defined; and the "solutions" are partial, uncertain, and largely ineffective. In other words, aging is not a problem so much as it is a predicament. Problems have solutions, predicaments do not. Peterson appreciates this—at least, he recognizes that there are no quick fixes—and he has written a succinct book in which he articulates his concerns. It is noteworthy that Peterson, who was US Secretary of Commerce under Richard Nixon and subsequently made a career on Wall Street, is a solid representative of the American Establishment. What Peterson says is likely also being said, albeit with less urgency, in the halls of Congress in Washington and in the boardrooms of the Fortune 500 companies.

Gray Dawn is wide ranging and, while aimed at promoting a particular basket of policies, does not ignore or dismiss other points of view. The statistical charts and figures, filled with devices like old people on canes and

*Review of Peter G. Peterson, *Gray Dawn: How the Coming Age Wave Will Transform America—and the World*. New York: Times Books, 1999. viii + 280 p. \$23.00.

pregnant women, although incongruous in a book of serious ambition, are entertaining and informative.

A few words are in order about Peterson's diagnosis and prescription. Population aging, he argues, will constitute an "unprecedented economic burden" (p. 31). Existing pension and health programs are "unsustainable" (p. 66). Steps to be taken include encouraging longer working lives (p. 127), eliciting greater labor supply from the non-elderly (p. 139), raising more children and endowing them with more human capital (p. 145), encouraging family support for the aged (p. 151), targeting pension and health care benefits on the basis of need (p. 155), and requiring persons to save for their old age (p. 160).

This is an intelligent assessment, and Peterson presents his case well. Nevertheless, I have two complaints. The first is that the diagnosis relies too much on blind extrapolation. "There's an iceberg dead ahead. It's called global aging, and it threatens to bankrupt the great powers," begins the blurb on the title page. These sorts of analogies—remember the wall of depleted natural resources that we were going to crash into?—serve both readers and authors ill. Many adjustment mechanisms and safety valves are built into the economic and social system. Some of these are simple neoclassical mechanisms set in motion by changing supply-and-demand conditions. Others amount to the state renegeing on promises made by earlier generations of policymakers, but we have become used to that. Disney (1996: 59–106) surveyed five pension systems (United States, Great Britain, Japan, Italy, and Australia) and concluded that only the Australian system is managing to meet its promises to any but the start-up generation. My second complaint is that most of the remedies Peterson prescribes are unlikely to work nearly as well as he thinks they will. My first complaint leads me to be more hopeful than Peterson. My second leads me to be more pessimistic. Maybe that is why, on balance, I liked the book.

In this review essay, I try to give a comprehensive assessment of how aging is likely to affect economic performance and ask, with Peterson, what policymakers can do to improve matters. Like Peterson, I concentrate mostly on industrial countries, although his coverage of the world is broader. My focus on pensions and retirement does less than full justice to Peterson, who also writes at length about health care. I can only plead that health care would require an essay in itself. I also leave aside most of the more speculative, provocative, and interesting points that Peterson discusses, such as the rising imbalance in the United States between the white elderly and the nonwhite (and/or non-native-born) young and the question of whether aging stifles a society's capacity for innovation.

Effects of population aging

If "population aging" is defined as an increase in the average age of the population, all populations are aging. However, when (as is more conven-

tional) “population aging” is defined as the transition from a high support ratio (usually defined as population aged 15–59 divided by population aged 60+) to a low support ratio, then the populations of the world fall into two groups. In the first, consisting of populations in Europe, the European regions of the former Soviet Union, and Japan, the support ratio is declining rapidly from an already diminished base. In the second group, consisting of populations in Africa, Asia, and Latin America, the support ratio is also declining, but it will not reach levels currently seen in the first group of countries until the middle of this century.

Two salient demographic aspects should be highlighted:

First, populations in the North will age from the middle of the age pyramid as persons in the large baby boom cohorts start becoming elderly in approximately 2010. Populations in the South, by contrast, are aging from the bottom, meaning that as today’s young persons move into the working years, they are being replaced by a much smaller cohort of children (the result of rapid recent fertility decline). Therefore, prospective demographic changes imply divergent trends in labor force growth across the two regions. Assuming that age- and sex-specific labor force participation rates remain unchanged, labor force growth rates will rapidly decline in the North and turn negative after 2010. In contrast, age-distribution changes are increasing the labor force in the South, where the support ratio will remain roughly constant despite a rapid increase in the elderly population.

Second, according to some economists, the proportion of the adult (15+) population in the prime saving years (40–59) should be an index as relevant as the more frequently cited support ratio. As the baby boom generation moves through the peak years of asset accumulation, this ratio will rise until approximately 2010 in the North and then commence an extended decline. In the South, this ratio will also rise until 2010; in contrast, however, it will remain fixed through much of the rest of the century.

The United States, which accounts for about 40 percent of the industrial world in economic terms, is a somewhat special case. Because the United States never experienced the extremely low fertility of Europe or the rapid fertility decline of Japan, the support ratio, already falling in other major industrial countries, will rise in the United States through 2010 before it starts to decline. Thereafter, the United States will resemble other countries in the rapidly aging group, although aging in the United States is not projected to be as extreme as in Europe and Japan.

Aging and the labor force

At the level of the individual, “aging” amounts to increased longevity. The post-World War II decline in age at exit from the labor force is often contrasted with rising life expectancy as though something unnatural were going on (e.g., Peterson, pp. 137–139). But while increased longevity (and

better health, a major determinant of older workers' labor supply) causes workers to wish to work longer, rising income causes them to wish to retire earlier (Costa 1995). As impressive as were the gains in life expectancy during the twentieth century, the gains in income per capita were greater still, so the tendency for earlier withdrawal from the labor force is not surprising. This tendency has been accentuated, however, by the expansion of public and private old-age pension arrangements (Wise 1997; Clark, Kreps, and Spengler 1978: 931–935). If the coming years see increased demands on public pension benefits and erosion of the annuity value of accumulated assets, as many forecast, then rising longevity and reduced disability and lower incidence of chronic conditions (Fogel and Costa 1997) will assert themselves in greater labor force participation at older ages. Reform of pension systems, which I discuss below, might also keep workers in the workplace longer. If economic growth continues to increase the demand for leisure, public authorities will be hard pressed to stop the trend toward earlier withdrawal from the labor force. Probably the most important variable over a time scale of decades, however, is the rate of productivity growth, which is practically impossible to project. On this, Peterson (pp. 95–97) is a pessimist, but this is just his innate conservatism coming to the fore. All bets are off in light of US experience in recent years.

At the level of the labor force, “aging” consists of an increase in the number of older workers relative to the number of young ones. At the same time, the slowdown in labor force growth linked to aging is reducing the supply of all workers. It is the combination of labor force aging and shrinkage that is important, not aging per se.

In a smoothly functioning labor market, slower aggregate labor force growth would increase the average wage relative to the rate of return to capital and lead firms to substitute capital for labor. At the same time, labor force aging would cause the wages of older workers to fall relative to the wages of younger workers. There would be no impact on unemployment of workers at any age.

The problem is that firm-level policies impede the smooth absorption of the “bulge” cohort of older workers into the workplace. In order to discourage shirking and encourage loyalty, firms tend to pay young workers less than their marginal product and old workers more than their marginal product. The reason that firms do not shed money-losing older workers is to maintain credibility in the eyes of younger workers. Under such circumstances, firms with an aging workforce face rising unit labor costs. Arguably the most sensible option is to free up the internal labor market so as to flatten the age-earnings profile, keeping older workers on the job while containing costs (Jackson 1998: 104–107). But firms fear alienating younger workers, who will correctly perceive that there is no reward for firm loyalty. Nor is the problem simply one of adjusting pay schedules. Benefits

programs, such as defined-benefit pension plans and health insurance programs, are structured so as to steeply raise the price of middle-aged and older workers (Peterson, pp. 134–135). Finally, some of the rigidities that discourage employment of the elderly may be in place for a reason. Part-time work, which many older workers desire, decreases the number of hours over which fixed costs can be spread and may stand in the way of teamwork.

One way out of this dilemma is pensioning-off, which sheds expensive older workers while preserving the appearance of having honored commitments. The typical firm sharply reduces pension accrual rates after an arbitrary fixed age, often 60 or 65 (Wise 1997: 86–87).¹ The result is to reduce the net wage to a fraction of the nominal wage (Hurd 1990: 594). Not surprisingly, many workers choose to leave the firm.

If the costs of exit were entirely internal to the firm through the operation of a pension scheme, the early retirement option would force a rise in contribution rates by increasing the number of beneficiaries and reducing the number of contributors (van Dalen 1996: 180). This would discourage younger workers and encourage even more older workers to retire.² But in the modern welfare state, a significant portion of firm-level costs of pensioning-off can be foisted upon an accommodating public social insurance system. In the United States as in many other postindustrial states, public pension arrangements encourage older workers to leave the workplace (Hurd 1990; Wise 1997; Gruber and Wise 1999). This is especially the case in continental Europe, where the main policy response to structural unemployment problems of the last quarter-century has been early retirement (van Solinge et al. 1998: 20–22), generous disability pensions (*ibid.*: 32–35), and special treatment of the older unemployed (extended benefits, relaxation of job-search requirements, etc.). Such measures reflect the “lump of labor” fallacy—there are a fixed number of hours to be worked and excluding one group from the labor market will mean more employment for other groups. The effect of policies to discourage employment of the elderly has been to keep the labor force artificially young, but this has only put off the day of reckoning. Eventually, fiscal pressures will force policymakers to scale back the social insurance programs that have allowed workers to leave the labor force at an early age.

In a modern economy an aging workforce need have no negative effect on productivity. The idea that older workers are less productive than young ones has long since been laid to rest (Jackson 1998: 95–100; Disney 1996: 182–188; Clark, Kreps, and Spengler 1978: 927–929).³ What old workers lack in dynamism, they make up for in terms of experience. They have lower rates of absenteeism, are less likely to move to another employer, and require less supervision than younger workers. They have been sorted and matched to the tasks for which they are best suited, a process not yet completed for young workers. Admittedly, the evidence that older workers

are as productive as young ones comes in large part from studies of job performance in mechanical tasks, such as sorting letters. In an age of rapid technological change, general skills (punctuality, e.g.) may become less important than specialized skills. The latter are gained by flexibility, mobility, and adaptability, all of which are characteristics that the older worker may lack compared to the young. Above all, however, these skills are gained by training.

As with their productivity, the ability of the old to acquire new skills has been underestimated. Although they have fewer expected years on the job, older workers have lower inter-firm mobility as well, so the rate of return on training older workers compares more favorably than might be thought with the rate of return on training young workers. Assuming rapid technological change, older workers will be in the strongest position when skills are quickly acquired and quickly depreciate, because they can keep their productivity high by episodes of short-term training (moreover, under such circumstances, young workers' skills are also being constantly eroded). The greatest threat for older workers is the introduction of an entirely new class of technology—such as digital technology—that requires extended training to acquire what is essentially a new mode of thought. However, if older workers can clear the digital hurdle, the move toward a knowledge-based economy may prove to be the greatest boon to older workers since the invention of eyeglasses.

When labor force growth is slow, incentives to innovate and use existing resources efficiently will be high (Habakkuk 1962), an argument that found empirical support at the aggregate level from Cutler et al. (1990).⁴ Another argument is that, as population aging increases the real wage rate, it will lead to a reallocation of investment away from physical capital toward human capital, with positive long-term implications for economic growth (Fougère and Mérette 1999). This might happen, for example, if forward-looking young persons anticipated that the rate of return to education would be especially high for members of a small cohort (Disney 1996: 174–178).

What can policymakers do? Peterson's advice, not surprisingly, is to encourage longer working lives. He specifically advises (pp. 137–139) withholding any retirement benefit until an advanced given age, but this is ill advised: policymakers should eliminate rigidities, not impose new ones. The policy objective is not to force people to work longer, but to encourage them to make time-consistent labor supply decisions (i.e., ones they won't regret later) that are in line with social costs and benefits.

Public pension reforms should seek to achieve a level playing field. Researchers at the OECD (Blöndal and Scarpetta 1999: Table V.6) estimated that achieving actuarial neutrality (i.e., a situation in which, at each age, the payroll contribution made if the worker stays in the labor force equals the present value of additional future benefits received) in such countries

as the United States, Germany, France, and Japan would have the effect of raising the labor force participation rate of males aged 55–65 by about 3–4 percentage points.⁵ Such a shift would represent a return approximately to the situation prevailing in the early 1970s.

One way to achieve actuarial neutrality is to move to a Chilean-style capital reserve–financed defined-contribution pension system.⁶ As I discuss below, daunting obstacles lie in the way of such reforms. However, the same result can be achieved more simply by eliminating perverse incentives in existing defined-benefit systems (Belan and Pestieau 1999).⁷ In fact, since the option for early retirement at a reduced pension is a standard feature in private defined-contribution pension plans, but tends to be narrowly available in public defined-benefit plans, one might argue that Chilean-style social security systems encourage early retirement (Venti and Wise 1989). Peterson himself notes (p. 130) that the problem, according to all indications, is that today's workers fully expect to retire young. In shifting to a Chilean-style system, an option is the notional defined-contribution approach (recently introduced in Sweden), which improves transparency by calculating pension benefits as if the system were defined-contribution, but eases transition problems by continuing to finance on a pay-as-you-go (PAYG) basis.

If such options, and others, are available, why are policymakers slow to eliminate distortions that encourage workers to retire early? The “lump of labor” fallacy is one explanation. Collusion with the private sector for reasons discussed above is another. Peterson (pp. 136–137) also blames excessive concern with hard-luck cases—coal miners and the like—“whose strenuous occupations or declining health make later retirement a genuine hardship.” Stated differently, the problem is that actuarial neutrality means forgoing redistribution. One man's efficiency gain is another man's inequity.

Even if public policymakers act, there are discouraging limits to what they can accomplish on their own. As Peterson recognizes, changing the behavior of firms (and unions) is likely to be more important than changing public pension rules. Most models attribute only a small portion of the observed decline in labor force participation rates of older workers to public pension arrangements (Hurd 1990: 605; Magnussen 1994: 48). Wise (1997: 92–93) estimated that, for a hypothetical American worker covered by both Social Security and a typical private defined-benefit pension plan, eliminating penalties implicit in the firm's pension arrangements would increase labor supply much more than raising Social Security retirement age. Lumsdaine, Stock, and Wise (1997) also found for the United States that, as between firm pension policies and Social Security policies, firm policies had far greater potential for delaying exit from the workforce. However, for workers who do not participate in a firm-provided pension scheme, Social Security retirement rules are crucial. One reason for the political appeal of mandated increases in the normal retirement age, I suspect, is that it is only workers

at the low end of the labor market who, having no wealth but their entitlement to public pensions, will be seriously affected.⁸ Early retirement is most characteristic of low-paid, low-skilled workers, whose health is often poor, whose life expectancy is short as a result, and for whom the opportunity costs of leisure are low, as is the amenity value of the workplace.⁹

Finally, as Peterson also recognizes (pp. 139–141), it is not just the labor supply of older workers that needs to be rationalized. The difference between the expected rate of return on public pension system contributions and the expected rate of return on personal savings can be interpreted as a tax; and as payroll taxes rise in an aging society, the deadweight costs of this tax—forgone output and tax revenue because workers choose to work less—will increase. Losses to official GDP and fiscal revenues would be especially high in countries where escape to the informal sector is easy and tax evasion is rife.¹⁰ Kotlikoff (1996), who estimates substantial efficiency gains to public pension reform in the United States, attributes most of these gains to eliminating distortions in the labor market.

In conclusion, the individual retirement decision reflects mainly life expectancy, arrangements concerning pensions and health insurance, and income. Trends in the first two will probably slow or reverse the tendency to retire early, while trends in the last are essentially unpredictable. Existing public pension arrangements give rise to substantial inefficiencies in the form of early retirement. Means exist to reduce such distortions, but they are politically difficult to implement. Payroll contributions to support social insurance programs also discourage labor supply at all ages, exacerbating the problem of adapting to population aging.

The early-retirement bias of public pension systems is not accidental: it has evolved in line with firms' desire to rid themselves of expensive older workers while preserving a wage profile steeply rising with age. It also reflects policymakers' incorrect belief that the fewer the number of older workers, the more job slots will be available for young ones. Fiscal pressures and the rising number of older workers relative to younger ones make it unlikely that current practices can continue. There is little reason to believe, however, that an aging labor force need be a lower-productivity one.

Aging, saving, and investment

A priori, age structure should affect both the supply of savings and the demand for investment. Regarding the first of these, age structure should affect both the income streams out of which savings are drawn and the consumption rate.

Most projections indicating that population aging will reduce household savings are based on the life-cycle hypothesis of consumption, according to which individuals save while young in order to maintain consump-

tion after they cease to receive labor income in old age. Life-cycle models are greatly complicated if one adds to the picture possible bequest motives, liquidity constraints (inability to borrow against pension wealth), precautionary motives (saving against contingencies such as ill health), and uncertainty (Browning and Lusardi 1996). Only in recent years have the data, computational power, and econometric methods needed to test the life-cycle hypothesis rigorously become widely available. Results have generally been mixed, with studies based on time-series data supporting the hypothesis more strongly than within-country studies based on cross-sectional data.¹¹ Nonetheless, Hurd (1990) concluded that the bulk of evidence supported some weakened form of the hypothesis. Deaton and Paxson (1997), while unhappy with the life-cycle hypothesis, fail to reject it.

The implication of the life-cycle hypothesis, if accepted, is that “aging from the middle,” as occurs in developed countries, will place increased demands on private savings by shifting population out of the prime saving years into the years when accumulated assets are converted into consumption while income from wages is low.¹² This view is not universally supported, though. Börsch-Supan (1996) argues that private savings in the OECD will grow for three reasons: the elderly are saving in defiance of the life-cycle hypothesis, economic growth raises the young’s share in total income, and the baby boom cohorts are relatively high-saving cohorts.

Peterson does not discuss private savings at length, concentrating rather (pp. 65–94) on a topic on which there is little disagreement: when government revenues and expenditures are projected by extrapolating current public pension and health programs, the result is invariably a flood of red ink. Roseveare et al. (1996), examining public pension and health systems in 20 OECD countries, estimated that, for the OECD as a whole, government deficits could reduce aggregate savings from 7.4 percent of GDP in 1995 to almost nil, or even to a negative rate, by 2030. Franco and Munzi (1997) reached equally pessimistic conclusions for the European Union. Börsch-Supan (1996) projected that, without rising taxes or reduced age-related public expenditure, widening government deficits would more than wipe out the private savings increases alluded to above, with a large gap emerging after 2005 between demand for investment and *ex ante* savings.

When presented with dire predictions based on extrapolation, one should keep in mind that they will never come to pass. Peterson would charge that this response evades the issue. But if social insurance systems are time-inconsistent (i.e., policymakers make promises on which they are later forced to renege), then surely it is a fallacy to analyze them as though they are not (van Dalen 1996: 159). Pension systems can be reformed, health care finances can be tightened, labor markets can be made more flexible, and so on.¹³ Peterson (p. 66) claims that fiscal meltdown scenarios are useful because they rouse policymakers and the public from their indifference,

but this is precisely how the Club of Rome modelers defended their far-fetched simulations. The excuse was thin then, and it is thin now.

On the other hand, in fairness, even models that incorporate a degree of economic behavior (including, naturally, the life-cycle hypothesis) project that aggregate saving rates are likely to decline. Three models reviewed by Auerbach, Cai, and Kotlikoff (1991) predicted a demographically driven decline in the US national saving rate beginning during the first decade of the twenty-first century, with each model predicting negative national savings by 2030–40. Auerbach and Kotlikoff (1987) also predicted a decline in the US national saving rate, while Auerbach et al. (1989) came to the same conclusion for the US, Japan, Germany, and Sweden.

Let us engage in some neoclassical heresy. Would lower savings necessarily be a bad thing? Change in population age structure might affect the *composition* of investment demand—more hospitals, fewer factories—but there is no reason to think it would affect the *level* of investment demand. By contrast, slower labor force growth will unambiguously reduce investment demand because a given path of per capita output growth can be maintained with less investment. The implication is that a given per capita consumption path can be sustained with lower saving. Stating the same thing differently, if the saving rate remains constant as labor force growth slows, then in a closed economy the result will be a rising capital–labor ratio and a lower real rate of return to capital (and a higher real wage rate). The best simulation exercise illustrating this effect is that of Cutler et al. (1990), who showed that, in a dynamic optimization framework, the optimal response to projected changes in the US population is a reduction, not the often-called-for increase, in the national saving rate.¹⁴ In the voluminous literature on US Social Security and savings (see below), it is conventionally assumed that the capital–output ratio in the presence of a pay-as-you-go-financed pension system will be below its optimal value. Thus, for example, Auerbach and Kotlikoff (1987) suggest that the welfare loss associated with lower capital formation in the presence of a PAYG-financed pension system characterized by a 60 percent income-replacement rate amounts in steady state to about 6 percent. However, in a model calibration that they claim better reproduces existing income–wealth ratios, İmrohoğlu, İmrohoğlu, and Joines (1995) find that the presence of a PAYG-financed pension system *increases* welfare by *reducing* capital formation.

Concern about insufficient savings and investment is coming from the school of economics (which Peterson discusses on pp. 194–198) that stresses learning-by-doing, increasing returns to scale, and other nonlinearities. Taken together, these can be boiled down to the proposition that the rate of technological progress is an endogenous variable (Romer 1990), in which case there can be no such thing as overinvestment. Anything that reduces investment, as population aging is likely to do (see below), reduces the wel-

fare of future generations (Marchand, Michel, and Pestieau 1996: 34–35). Slower growth in the capital stock will increase its average age, a distinct disadvantage in a time of rapid technological change. Similarly, one might argue that only young workers use new, superior technology, so an older labor force will be dependent on obsolete technology. With a smaller labor force, fixed costs of invention and innovation will be spread over fewer workers. All of this is, readers of this journal will know, essentially Simon's (1981) argument in *The Ultimate Resource*. Maybe, in a knowledge-based economy, such arguments are more relevant (Simon certainly thought so).

Once again, what can policymakers do? Let us take the prudent course, as Peterson does, and assume that there really is a need for greater savings in anticipation of population aging. Can changing public pension arrangements generate these savings? It is doubtful.

Consider a closed economy in long-term steady state. Only three strategies are available to finance the consumption of the nonworking elderly:

One is for current workers to transfer income to current nonworking elderly, either directly at the level of the family or indirectly through a PAYG-financed public pension system. Assuming that the nonworking elderly consume all of their income (i.e., transfers) and that workers save at least some of theirs, the impact of population aging will be to reduce the aggregate saving rate on compositional grounds (Deaton and Paxson 1997: 97).¹⁵

A second strategy is for the state to borrow in order to finance consumption of the nonworking elderly through the public pension system while leaving payroll taxes unchanged. In this case, population aging will increase the public-sector deficit and again reduce the aggregate saving rate. Examples are the financing of public pension system deficits through general revenue, as in Europe, and the use of pension system deficits to relax fiscal constraints elsewhere in the budget, as was the case until recently in the United States.

The remaining strategy, which can be implemented only over time, is for today's workers to save, whether privately or through a capital reserve-financed public pension system, in order to finance their own retirement. In this case, projected age-structure trends in developed countries will increase the saving rate as members of the baby boom generation move through their prime saving years. Starting around 2010, however, retiring baby boomers will begin to sell off the assets they have accumulated (to younger persons who are accumulating assets to finance their own retirement) and convert the proceeds into consumption (Schieber and Shoven 1994).¹⁶

The first strategy transfers income, and thus claims on real resources, from the current young to the current elderly; the second transfers claims on real resources from the future young (i.e., taxpayers) to the current elderly; and the third transfers claims on real resources from the current young to the future elderly. Whichever approach is followed, the goods consumed by the elderly still come out of the stock of goods currently produced and

thus offset potential savings one for one. All else being equal, an older society will save less.

The major advantage of the accumulation-based strategy is that, in theory, higher saving in the medium term will translate into higher capital accumulation, which will result in higher output in the long term.¹⁷ Since the future young also benefit, in the form of more capital per worker and hence higher wages, the accumulation-based strategy offers some equity advantages in an aging society. Beneficial effects might also accrue from financial deepening, which would stimulate the growth of a financial sector well suited to allocating capital (James 1998).

There is an elegant theoretical literature, which Peterson fails to mention, on whether the institution of a PAYG-financed pension scheme will discourage savings, and a huge empirical literature growing out of it that tests whether public pension wealth is inversely related to savings. Mag-nussen (1994: 40) was unable to derive any definitive conclusion from his review of some two dozen articles. Studies reviewed by the OECD suggested that public pensions in member countries have reduced the volume of private savings by 10 to 30 percent (Kohl and O'Brian 1998: 11). The problem with this literature, in addition to the fact that it is inconclusive, is that the consequences of creating a PAYG-financed system from scratch may not tell us very much about the consequences of moving from an existing PAYG-financed system to a capital reserve-financed one (Orszag and Stiglitz 1999).

As Peterson describes well (pp. 99–103), the problem is what to do about the transition cohorts, which face the prospect of paying twice—once to honor commitments under the existing PAYG-financed system and once to accumulate the capital reserve that will finance the new pension system. The blow can be cushioned by debt finance, but, absent Ricardian equivalence, debt-financed transition defeats the purpose. In the limit, a transition financed entirely by debt simply replaces one form of obligation (payroll taxes to support the PAYG-financed pension system) with another (taxes to pay interest on the public debt). One interpretation of such a reform is that it just replaces implicit debt with explicit debt. Some economists (like Alan Greenspan) think this is a good thing; others argue that people (and financial markets) are not deceived: they know exactly how much debt exists. Debt-financed transition is especially unattractive when the real interest rate is greater than the rate of population growth, in which case the real per capita value of government debt rises over time (Disney 1996: 56). But high real interest rates combined with low population growth pose a problem not only for debt incurred during the transition process, but also for debt created to meet unrealistic pension promises made by the pretransition pension system, so we are back where we started. Tax-financed transition has the disadvantage that tax increases militate against efficiency gains in the labor market. This leaves reductions in government consumption as a source of finance, but these are everywhere politically difficult to achieve.

Peterson's advice (pp. 160–174) is to require people to save for their old age, accepting that the transition cohorts will have to pay for two retirements: their parents' and their own. But here Peterson displays no acquaintance with the literature that describes households' ingenuity in thwarting policymakers' good intentions. If accumulation were required through the public pension system or schemes imposed on employers, then households might simply save less (or, equivalently, if they are not liquidity-constrained, borrow more) elsewhere in their budgets (Disney 1996: 42).¹⁸ Evidence relating to private pension plans indicates that households offset increases in pension wealth by decreases in other forms of wealth, although there is disagreement on the size of the offset (Gale 1995; Poterba, Venti, and Wise 1997).¹⁹ The OECD concluded from a review of studies that about half of an increase in private pension wealth is offset by reduced savings in other forms (Kohl and O'Brian 1998: 11). Feldstein (1996: 8) believes that about half of each additional dollar in US households' retirement savings accounts translates into higher individual savings.²⁰

If retirement saving behavior cannot be compelled, can it not at least be encouraged? Here, Peterson (pp. 171–172) is rightly pessimistic. First (although Peterson does not make this point), tax exemptions, the most common tool, have both substitution effects (the price of current consumption increases relative to later consumption, so households save more) and income effects (after-tax income is higher than it would have been had the savings not benefited from tax exemption, so households consume more). There is typically a ceiling on the amount of retirement savings that can be deducted from taxable income. Low- and moderate-income households, which would be saving less than the ceiling before the exemption was instituted, experience both income and substitution effects and may save more or less, depending on the relative magnitudes of the effects. High-income households, which would have been saving more than the ceiling before the exemption was instituted, experience only the income effect and unambiguously save less.²¹ Second (and Peterson makes this point), government also unambiguously saves less: not only has household taxable income been reduced, but some capital gains that would previously have been taxable are now accruing to assets held in tax-sheltered accounts. The best ways to maximize the impact of schemes that encourage saving are to (1) make saving mandatory, not voluntary, (2) make it impossible to borrow against retirement assets, and (3) tax capital gains in the saving scheme like capital gains anywhere else (Bailliu and Reisen 1997: 30). None of these three options is likely to be politically popular.

Empirical evidence is mixed. Most national case studies have found a positive but modest impact of private tax-sheltered retirement saving schemes on national saving rates. Studies reviewed by the OECD (Kohl and O'Brian 1998) suggest that tax incentives raise private savings by 20 to 25 percent of total contributions, with the impact on national savings being less because of the

fiscal offset. In international cross-section, however, a significant positive relationship holds between pension system assets and the aggregate saving rate (Bailliu and Reisen 1997).

A common fallacy is that because of the individual-level link between contributions and benefits, capital reserve-financed pension arrangements have only to adjust to individual aging (i.e., longevity extension), not to population aging (i.e., change in population age structure). However, this notion ignores the link between demography and the rate of return to capital (Fischer and Reisen 1994: 10). As the labor force grows more slowly, the capital-labor ratio rises, exerting downward pressure on the rate of return to capital or, equivalently, asset prices. Members of the baby boom generation, it might be argued, are buying dear as they save and will be forced to sell into a glut when they desire to dissave or annuitize (Schieber and Shoven 1994).²² Time-series analysis reveals no consistent relationship between age structure and rates of return on various asset classes (Poterba 1998). But this comes as no surprise, because asset returns are volatile while population age structure is not.

Peterson acknowledges these points (pp. 185–186 for real estate, p. 191 for financial assets), but his discussion of financial markets is surprisingly muddled for someone who works on Wall Street. On page 102, when arguing that debt-financed transition to a capital reserve-financed pension system is a free-lunch fantasy, he is scathing in dismissing the “equity premium” (i.e., the gap between the rate of return on common stocks and the rate of return on government bonds). Government is borrowing money (selling bonds and thus driving up bond yields) to pay off existing pensioners while workers invest in the stock market what would have been their contributions into the PAYG-financed system (thus driving down stock returns). But on pages 172–173, when he discusses the virtues of instituting mandatory private saving accounts while holding the fiscal line, the equity premium is back again. Here, Peterson assumes that government is not incurring additional debt (the transition cohorts are paying twice), so admittedly bond yields are not directly affected. But the price of stocks would assuredly be driven up while savers accumulated and driven back down again when they sold. What accounts for Peterson’s fuzziness here?

Even if policymakers are unable to elicit added savings, they might still achieve an efficiency gain if existing savings were reallocated from government (i.e., the public pension system) to households’ personal retirement saving accounts. This would occur if households, through their financial agents, were more efficient than the state at allocating savings across investment projects (James 1998: 276). One of the most popular proposed changes in Social Security in the United States is the allocation of a portion of contributions to the equity market. However, the ultimate macroeco-

conomic impact such a shift would generate is hard to discern. The impact on household portfolios is likely to be minor and of uncertain sign: households will acquire equities through the Social Security system but will reduce their non-Social Security equity positions in order to purchase Treasury obligations that would previously have been bought by the Social Security system. Whether the Treasury borrows directly from households via the capital markets or indirectly via the Social Security institute's purchase of government securities would have only a minor effect on the real economy.²³

What conclusions can we draw? Projections of the impact of aging on private savings are in large part dependent on the life-cycle hypothesis, which has lost some of its erstwhile authority. Most economists probably believe that population aging will place downward pressure on private savings, but the view is not universal. There is, by contrast, universal agreement that aging will exert increased pressure on government balances. Nonetheless, fiscal gloom-and-doom predictions, of which Peterson makes a great deal, deserve to be taken with a grain of salt. They are not meant to be predictions, but hortatory exercises illustrating the grim consequences of inaction.

The purpose of economic policy is not to encourage high saving rates. Saving is warranted only if the present value of the expected increase in future consumption makes it worth forgoing current consumption. Neoclassical theory suggests that population aging represents a golden opportunity to support the same consumption path with lower investment and hence lower savings. This view, naturally, is not popular in orthodox policy circles, nor with Peterson. The underlying assumption—which Peterson makes clear but others rarely do—is that there are external benefits to higher investment.

An older society will inevitably have a lower saving rate than a younger one because the ratio of consumers to producers is higher.²⁴ This will be equally true whether the pension system is PAYG-financed or capital reserve-financed, whether it is defined-benefit or defined-contribution, and whether it is public or private. If policymakers could increase savings during the transition to an older society, however, the economic pie might be enlarged and the difficulties of supporting a larger elderly population might be diminished. Unfortunately, the evidence that they can do so is not particularly strong. The transition from PAYG financing to capital reserve financing (whether a public pension system or individual retirement saving accounts) is likely to increase national savings only if the transition cohorts are willing to finance both their parents' retirement and their own. Measures to mandate private retirement savings can have some effect, but there are substantial offsets elsewhere on the household balance sheet. Measures to encourage private saving are also subject to offsetting behavior at the level of the household; in addition, the impact on national savings is modest once account is taken of forgone fiscal revenues.

Aging, the distribution of income, and transfer programs

The effect of aging on intergenerational distribution will be determined by the fact that the young live on labor income while the old live on wage-based transfers from the young and from income derived from accumulated assets. Assume, first, that there are no transfers. Then population aging would improve the welfare of the young by raising the wage rate relative to the rate of return to capital. The same change would reduce the welfare of the elderly, who are sellers of capital and purchasers of labor services. Within cohorts, population aging would reduce inequality because the poor depend on labor income while the rich earn rents. The story is likely to be complicated, however, to the extent that workers of different ages are imperfect substitutes (Disney 1996: 156–174). When age-structure change is imposed on a labor force of given aggregate size, the wages of young skilled workers may rise relative to those of old skilled workers, because the two are poor substitutes (think of computer programmers). The wages of young unskilled workers, by contrast, might remain unchanged relative to the wages of old unskilled workers, because they are close substitutes (think of taxi drivers). The result might be to widen income inequality (between skilled and unskilled workers) in the young age group while reducing it in the old age group.

Both theory (the life-cycle hypothesis) and empirical evidence show that inequality in the distribution of income rises linearly with age (Deaton and Paxson 1997) and that inequality in the distribution of wealth follows a U-shaped curve with a minimum around age 40. Thus, population aging redistributes people from low-inequality age groups to high-inequality age groups. Population-wide indexes of inequality might rise as a result, but it is not clear why this purely compositional effect should be a source of concern.

These inferences have the advantage of being straightforward. However, it is an oversimplification to assume away transfers. The role of PAYG-financed public pension systems for the elderly as a whole can hardly be overemphasized, and, for the elderly poor, public transfers are a matter of life and death.²⁵ Most of *Gray Dawn* emphasizes the need to contain intergenerational transfers. I can think of at least five salient insights that have emerged from research on the role of intergenerational transfers.

The first of these has to do with the welfare impacts of aging. Neoclassical theory asserts that a decline in aggregate population growth leads to an increase in the equilibrium level of per capita output (Solow 1956). However, when population is disaggregated by age and a system of intergenerational income transfers is put in place, this increase in aggregate output may not be advantageous from the standpoint of a representative individual, who is interested in his or her lifetime consumption. The population aging asso-

ciated with slower population growth widens the “spread,” now typically three to seven years, between the average age of consumption and the average age of production. The effect, for given income transfer rates, is to reduce the net transfer income received by the average individual over a lifetime (Arthur and McNicoll 1977, 1978). This is the Ponzi-scheme aspect of PAYG-financed pension schemes in reverse (van Dalen 1996: 172). Whether the negative impact on per capita consumption of this reduction in transfer income is greater or less than the positive impact of greater output per capita is an empirical question (Ermisch 1989). Lee and Lapkoff (1988: 643–644) conclude that the average individual in a slow-growing, old population will be materially better off than the average individual in a fast-growing, young one (whether he is better off in a welfare sense would depend on the substitutability between children and consumption in the utility function). But this result is by no means assured, and breaks down entirely if the system of intergenerational income transfers becomes dysfunctional.

The second insight has to do with understanding the conditions under which intergenerational transfers become unsustainable. Assume that the old receive (and consume) their income in the form of transfers from the young, who consume whatever is left over. If the goal of policy is to maintain a basic fixed income for the aged, then the higher transfers required when the dependency ratio (the inverse of the support ratio) rises can be paid out of productivity growth. The share of output that the young transfer to the old need not rise over time and, if productivity growth is sufficient, may decline. However, if the goal of policy is to make the income of the elderly proportional to the income of the young, then regardless of productivity change the share of output that the young transfer to the old must rise in an aging society.²⁶ Thus, attempts to maintain parity between young and old by relying purely on intergenerational transfers are bound to place increasing strains on an aging society and, as aging progresses, must eventually fail, even when productivity growth is adequate. With this in mind, the danger of coming decades is that the baby boom generation will use its ballot-box power to force transfers that hobble the young (keep in mind, however, that real wages are likely to be higher). As Peterson (pp. 203–213) asks rhetorically, “Does intergenerational warfare lie ahead?”

The third insight is that there are some reasons to be pessimistic in answering the question just posed. Public choice models going back to Browning (1975) suggest that collusion between old and middle-aged voters will lead to expansion of intergenerational transfer programs. The empirical proof lies in generational accounts (although these suffer from the defects of extrapolation exercises discussed above), which show sharply rising net tax rates for tomorrow’s young. Gokhale, Kotlikoff, and Sabelhaus (1996) document huge increases in elderly consumption in the United States,

to the point that the total consumption of 60-year-olds is now almost as high as that of 40-year-olds. The authors ascribe the increase in elderly consumption to the provision of a lifetime inflation-indexed annuity through the Social Security system and of third-party-financed, in-kind medical services through Medicare. The market failures addressed by these provisions are real (see Friedman and Warshawsky 1990 for the annuity market; Barr 1992 for the health insurance market), but the generosity of the policy response seems excessive. Heller, Hemming, and Kohnert (1986: Tables 4 and 5) illustrate that the problems of PAYG pension systems in industrial countries can be mostly ascribed to rising income-replacement rates, not to growth in the number of pensioners.

When considering the intergenerational conflict question, one should not take for granted that parents are altruistic toward their children. If they were, one would expect them to make transfers of income and wealth to those children who are in greatest need, rather than transferring evenhandedly. The evidence on this topic is mixed (McGarry and Schoeni 1995; Laferrère 1999). When it comes to current transfers, parents tend to behave altruistically; however, they fail the altruism test when it comes to bequests. US panel data on the decumulation of wealth by age suggest that parents dissave at the same rate as non-parents (Hurd 1990), a finding that casts doubt on the existence of any bequest motive at all (i.e., observed bequests may be accidental).

The fourth insight concerns rates of return on contributions into capital reserve-financed as opposed to PAYG-financed pension systems. One factor driving the pension reform debate is that members of the baby boom generation and their children are receiving a much lower rate of return on pension contributions than did earlier cohorts. In the United States, depending on household structure, a head of household who turned 65 in 1970 could expect to benefit from a rate of return in the range of 6–9 percent per year; a typical baby boomer turning 65 in 2020 may expect to receive 2–3 percent annually. This decline is mostly attributable to the maturing of the system, which eliminates the windfall gains provided by legislative fiat to early participants. There is not much that policymakers can do to combat the maturation of pension systems (although they often try, by bringing new participants into the system).

Even in mature pension systems, however, ways may be found to improve the rate of return in an aging society. Samuelson (1958) and Aaron (1966) showed that slow labor force growth and slow productivity growth reduce the rate of return to contributions to a PAYG-financed system (equal to the rate of growth of the wage bill) relative to the rate of return to a capital reserve-financed system (equal to the financial rate of return). In doing so, these conditions increase the attractiveness of capital reserve financing. Aaron's Law (Aaron 1966: 372) states that institution of a PAYG-

financed pension scheme can increase the welfare of each generation if the sum of the rates of growth of population and real wages exceeds the financial rate of return. Conversely, if this condition is not met, a generation that invests in a PAYG-financed instead of a capital reserve-financed pension system harms future generations. A corollary to Aaron's Law, the "paradox of social insurance," states that provided the condition above is met, an individual will receive a higher rate of return by participating in a PAYG-financed pension scheme than by saving (or participating in a fully funded capital reserve-financed pension scheme). The intuition is that in a capital reserve-financed system, a generation of size N_1 is financing the retirement of a generation of size N_1 , whereas in a PAYG scheme it is financing the retirement of a generation of size $N_0 < N_1$. The paradox disappears when population growth slows or turns negative, the financial rate of return rises, or there is negative growth in the real wage bill.²⁷

Finally, a fifth insight is noteworthy. Demographers are accustomed to concentrating more closely on fertility than mortality when discussing age distributions. In the pension context, however, it is a mistake to underestimate the impact of increasing longevity. In the case of fertility decline, the number of workers is reduced with a 20-year time lag while the number of retirees remains the same (vis-à-vis a scenario in which fertility did not decline) for some 60 years. Fewer workers must support the same number of retirees, and either wage-based tax rates must rise or there must be an equivalent reduction in benefits (whether directly or by means of an increase in the normal retirement age) or an increase in the effective retirement age. However, the reduction in the number of workers will increase the real wage rate, so the payroll tax rate will not have to increase nearly as much as would be predicted by a partial equilibrium model (Auerbach et al. 1989; Auerbach and Kotlikoff 1990).²⁸ In the case of longevity extension, by contrast, the number of nonworking elderly increases immediately (for fixed effective retirement age) while the number of workers remains the same (for fixed labor force participation rates). The same number of workers must support a larger number of elderly, so the payroll tax rate must again increase.²⁹ This time, anyway, since factor availabilities are unchanged, the real wage rate is unaffected. Thus, whereas fertility decline sets in motion forces limiting the required increase in wage-based tax rates (which, in any case, is some 20 years in the future), longevity extension translates directly, and immediately, into higher demands on workers.

What steps can policymakers take? An anecdote has it that President Franklin Roosevelt once boasted: "The way this thing [the US Social Security system] is put together, those bastards on Capitol Hill [the legislative branch] will *never* be able to take it apart." If true, it was a prescient remark. In an aging society, pension financing should without question switch from PAYG to capital reserve financing. The problem is that the Samuelson-Aaron

logic, so crisp when the blackboard is blank, is not nearly as useful when it is already marked up (Orszag and Stiglitz 1999).

When a transition occurs from PAYG to capital reserve financing, three adjustments must be made to the projected rate of return on contributions into the new system. The first reflects the neoclassical tenet that the more capital accumulates, the more its rate of return declines; but let us assume that this offset is modest. The second is that the financial rate of return must be adjusted for investment risk (i.e., risk of retiring during a bear market); but let us assume that this adjustment is also modest. After all, investment risk in a capital reserve–financed system must be balanced against the near-certainty that governments will fail to make good on the promises of current PAYG-financed pension schemes. The third and really significant adjustment is that transition costs must be taken into account by adjusting downward the financial rate of return to reflect the taxes necessary to meet obligations of the existing pension system when it is dismantled (Mitchell and Zeldes 1996: 366). When this adjustment is made, reform proposals look far less attractive. For example, Burtless and Bosworth (1997: 10–12) present calculations made by the Office of the Actuary of the US Social Security Administration comparing the rate of return in a business-as-usual scenario (including rising payroll taxes) with the rate of return under a partial “privatization” plan presented as an option by the Advisory Council on Social Security. Under this option, the payroll tax rate would be immediately raised by 1.5 percentage points (to cover liabilities of the pre-reform system), and 5 percentage points of contributions would be allocated to individual investment accounts. This corresponds closely to Peterson’s proposal for mandatory saving accounts. The findings of the Actuary demonstrate clearly that there is no benefit from such a change for those born before 1970. It is difficult to understand how a reform that essentially bypasses those over age 30 could attract much political support.

Whatever the means of financing, population aging is certain to prompt intergenerational conflict and debate. Under a PAYG-based regime, the debate will surround rising payroll taxes and shrinking pension benefits. Under capital reserve financing (whether through the public pension system or private retirement saving accounts), the focus of concern will be on the negative impact of aging on the purchasing power of pensioners’ assets vis-à-vis the real wage. It is not clear that the second type of political debate will be more constructive than the first; indeed, I suspect the opposite.

Political problems also affect what have come to be called “parametric” reforms—adjusting the levers of the pension system rather than fundamentally changing its structure. Leimer and Petri (1981) examined the implications of such reforms on various birth cohorts in the United States. From the viewpoint of older cohorts, whose retirement is in sight, the most favorable approach to strengthening the system’s finances is to raise payroll

taxes. From the viewpoint of younger cohorts, the most favorable approach is to cut pension benefits, on the assumption that forward-looking members of the middle-aged cohorts will begin to save in anticipation of lower benefits. Remove the forward-looking assumption and young cohorts will be indifferent as between tax increases and benefit cuts: in either case they will end up supporting their parents, in the second case through private transfers.

If there is less than meets the eye to the various proposed changes in public pension system financing, then policymakers will have to cobble together a strategy from a number of measures. As Peterson puts it (p. 122), “Everything will have to be on the table”—retirement age, cost-of-living adjustments, means testing, and so on. I agree. The problem is that just being on the table is not the same thing as being effective. Changes in public pension retirement ages, as mentioned above, can have only limited impact. Means testing (Peterson, pp. 155–160) is slippery. When asset tests are imposed, households adapt their lifetime saving and labor supply strategies in order to benefit from transfers in old age, or they engage in devious behavior such as transferring assets to children. “Earnings tests,” which reduce benefits when the recipient earns income, are self-defeating because they discourage labor supply of older workers. This leads to losses all around: pensioners lose a chance to augment their incomes, and government loses tax revenues. Even breaking the link between pensions and wages, a cost-saver that policymakers around the world have discovered, has its downside. Indexing pensions to wages addresses the market failure implicit in the fact that children cannot transfer their human capital to their parents, as a result of which parents might underinvest in their children’s education. Admittedly, it is not clear that pensions policy (as opposed, say, to subsidies for education) is the most effective way of approaching the problem of educational underinvestment.

Current income transfers from children to aged parents, while the norm in Asia, are rare in the West (see Kotlikoff and Morris 1989 for the US case) and always have been (Willmore 1998). Any move to reduce public pension benefits will, however, likely lead to greater private transfers (offsetting again any potential impact on savings). Leimer and Petri (1981: 14) cite the finding that in the United States every dollar reduction in public transfers might lead to a fifty-cent increase in private transfers. Peterson (pp. 151–155) is all in favor of the emphasis on filial obligation. This is fine as a cost-saving measure, but the welfare implications are unclear. The purpose of public policy is not to promote close family ties but to make people happy. Some families may derive utility when direct personal transfers are substituted for indirect, impersonal ones through the public pension system; others may derive disutility. The laws of contract governing public transfers are black-and-white; those governing private ones are complex and may involve efficiency loss (Bernheim and Stark 1988). On the other hand, there

is better information at the family level (i.e., children understand their parents' needs better than government does), reducing problems of moral hazard.

Summing up, most households do not spontaneously save for their retirement, and if they do, they do not save nearly enough. Some of this is attributable to myopia, some to free riding (not saving in anticipation of forcing a humanitarian transfer), and some of it to the fact that many households simply do not have enough money to save. Therefore, the likely result of a *laissez-faire* approach to income in old age would be that a significant proportion of the elderly population would live in destitution or be at the mercy of private charity. This is not acceptable.

The prevailing form of providing income in old age, PAYG-financed public pensions, is poorly suited to an aging population. The benefits of moving to a better-suited capital reserve-financed system, however, will not materialize in the near future. Unless older voters, including the baby boom generation, can be persuaded to put their personal interests aside, the politics of pensions will probably ensure that the bulk of income in old age will continue to come from pension systems that greatly resemble today's. The reforms that can be foreseen are incremental, parametric corrections designed to curb the innate tendency of countries' social security systems to overextend themselves (MacKellar and McGreevey 1999). One way of looking at this is to observe that social security lies at the very core of the welfare state, and the different forms assumed by the welfare state, in turn, reflect differing social attitudes toward risk. The sweeping World Bank-sponsored social security reforms in Latin America and the formerly socialist countries have occurred because the countries have undergone a fundamental ideological and political shift; in Western Europe, the United States, and Japan, reform is likely to be modest because no such shift has occurred.

If this forecast is correct, then the coming decades will see nonstop bickering between the generations as governments steer a course between rising pension costs and a return to widespread old-age poverty. Because of the simple mathematics of intergenerational transfers, it appears likely that social security will revert to a role much closer to the original Beveridgean ideal of providing a basic income.³⁰ This may be less painful than might be thought, because, on average, members of the baby boom generation are doing well economically (Easterlin, Schaeffer, and Macunovich 1993). However, poor baby boomers, having done no better and in many cases worse than their parents, will be at risk. Many will retire after lives of social disorganization, with no spouse or children and no assets apart from public pension benefits.

Open-economy aspects of population aging

In a neoclassical world, the differing demographic dynamics described above would set trade and capital flows in motion. Capital would flow from the

rapidly aging countries to less rapidly aging countries, where the capital-labor ratio is lower and the rate of return to capital is higher (Blanchet and Kessler 1991; Börsch-Supan 1996; Cutler et al. 1990; Masson and Tryon 1990; Higgins 1997). The main flows would be from Western Europe and Japan to Northern America and from the industrial countries as a group to the less developed countries. By draining capital from the industrial countries, these flows would raise the domestic rate of return to capital and lower it in the receiving countries. Households would also earn a higher rate of return on capital invested abroad, although some of this would represent a risk premium. Consumption in the regions receiving capital inflows would be higher because more capital would be available per worker.

The open-economy adjustment mechanism just described has the makings of a virtuous cycle—providing a more efficient way of accumulating assets for the aging North and of promoting more rapid development for the younger South. “Once freed, money may well flow disproportionately to developing countries. For this is the surest way to beat demography,” wrote *The Economist* eight years ago (20 June 1992). But there are two problems.

The first problem is that model simulations (Turner et al. 1998; MacKellar and Reisen 1998) conclude that the quantitative significance of the gain in developed countries is likely to be modest, especially relative to the sums of money involved. To some extent this is true because the faster industrial-country capital is poured into developing countries, the faster the rate of return to capital in the latter region declines. The second problem, closely related to the globalization debate more generally, concerns distributional issues in the North. The beneficiaries of improved asset allocation are lifetime savers, who are the well to do. The lifetime poor, who depend on labor income while young and public transfers when old, suffer twice: when they are young as wage rates are reduced (*vis-à-vis* an autarky scenario) by capital outflows, and again when they are old and the lower wage bill puts downward pressure on PAYG-financed public pensions (MacKellar, Ermolieva, and Reisen 1999).³¹ These results are admittedly neoclassical; they do not take into account the benefits of financial deepening in developing countries and of increased openness in both developing and developed regions (Holzmann 2000).

Labor mobility is another characteristic of an open economy. As Northern societies age, policymakers will almost inevitably be forced to come to terms with significantly higher levels of net immigration. While this can relieve labor market pressures, there is no question of “solving” problems of PAYG pension systems by importing young workers from developing countries; the required numbers, as Peterson points out (p. 98), would be massive.

In business circles, it is taken practically for granted that high social insurance benefits, including pensions and health insurance, erode a country’s ability to compete internationally. In labor circles, globalization is

equated with erosion of benefits and “social dumping.” Several fallacies undermine this way of approaching the problem. First, countries do not compete as firms do; in fact, the very concept of “international competitiveness” is ambiguous. Even if the flawed notion of international competitiveness is accepted, however, it is not clear that high social insurance contributions raise the net wage (gross wage minus employer’s and employee’s contributions to social insurance). The economic (as opposed to legal) incidence of the payroll taxes used to finance social insurance depends on the demand and supply elasticities of labor (i.e., their responsiveness to changes in the real wage rate). All econometric evidence suggests that the economy-wide price elasticity of labor supply is near zero.³² In a world of immobile labor and mobile capital, it is fair to assume that the long-run incidence of public pension payroll taxes is entirely on labor. Therefore, in a flexible labor market, high payroll taxes will lead to lower net wages and firms’ unit labor costs will be unaffected. In rigid labor markets, however, those workers who are in a strong bargaining position (typically the skilled) benefit in the form of higher net wages, while those who are in a weak bargaining position (typically the unskilled) are made unemployed. This is the intuition behind the general feeling that European social programs have led to substantial unemployment among low-skilled workers (Siebert 1997). Add to the picture generous social benefits for the unemployed and the result is a witch’s brew of high costs, low price competitiveness, and structural unemployment.³³ However, the root of the problem is the labor market, not the structure of social insurance or population aging.

To conclude, globalization is giving rise to welcome efficiency gains, but its potential to ease the problems of population aging is limited. Better portfolio allocation will help only those who have portfolios to allocate, and the improvement in the rate of return appears to be modest. Reducing barriers to international migration would help to balance out the global labor market but has limited potential to solve the financing problems of industrial-country pension systems. Reducing social insurance benefits might result in lower unit labor costs in some countries, but in many others it will not: either the labor market is highly flexible (the United States) or social benefits are explicitly taken into account in the tripartite wage-setting consultative process (Germany, Sweden).

Conclusion

One of the strong points of *Gray Dawn* is that, while Peterson makes no secret of his conservative political agenda, he also recognizes that population aging will have pervasive economic impacts regardless of the extent of government support for the elderly. Peterson is optimistic that policymak-

ers can act effectively, which is presumably why he concludes *Gray Dawn* with a call for a summit on aging and the institution of an Agency on Global Aging. I am less sanguine than Peterson, and, arguably, the last thing we need is another international agency. To summarize the discussion above,

—Policymakers can eliminate the distortionary features of public pension systems that encourage workers to retire early. They have so far failed to do so because they are reluctant to forgo redistribution, meaning that they cannot muster the necessary political support. Some have also fallen prey to the fallacy that excluding older workers from the labor force will increase the employment of younger workers. However, firms' retirement provisions and employment practices are much more important than public pension retirement provisions in determining age of exit from the labor force. The key to adapting to the aging of the labor force lies with the private sector, including unions, not with government. Government can, of course, serve as a great example setter (think of the US military in the matter of race discrimination). Luckily, an aging workforce need not be a less productive one, especially as we move toward a knowledge-based information economy.

—The state can do relatively little to increase savings short of engaging in the requisite saving itself. Raising taxes worsens distortions and multiplies deadweight costs, so the only road to greater public savings, short of sustained rapid economic growth, is cutting public expenditure. Voters appear to have no stomach for this. Perhaps it does not really matter: in an aging world, savings and investment may be overrated because labor force growth will be slow. Others, however, would reply that the "new economy" places a greater premium than ever on investment in new technology.

—While demographic conditions clearly indicate that there should be a transition from pay-as-you-go to capital reserve financing, the political chances of this occurring are slim. The best we can hope for is probably the allocation of some small fraction of public pension contributions to a capital reserve and a modestly increased role of private savings.

—Superior global allocation of retirement saving portfolios can only add a few basis points to the rate of return. Moreover, the beneficiaries are those who are relatively well off; the poor who depend on labor income when young and public pensions when old are unambiguous losers from globalization.

Whatever steps policymakers take, young people are going to have to pay higher taxes (out of higher incomes), old people are going to have to work longer, and retirees are going to have to get by on pensions lower than they were promised and on sales of assets likely worth less than they had hoped. There is no solution, which is why aging is a predicament, not a problem.

Notes

In writing this review, the author benefited from discussions with a number of members of the IIASA Working Group on Global Population Ageing, Social Security, and the International Economy, which met in Laxenburg, Austria in June 1997 and March 1998. Among those whose thoughts have found a way into this review are Gerry Adams, Roger Bird, Michael Davenport, Matthew Higgins, David Horlacher, Gordon MacDonald, Les Mayhew, William McGreevey, Steven Ney, Edward Palmer, Helmut Reisen, Thomas Schelling, and Naohiro Yashiro. Nathan Keyfitz, Ronald Lee, and Lary Willmore provided valuable comments.

1 In the United States, employer-provided retiree health insurance offers another inducement to leave the workplace (Rust and Phelan 1997).

2 An alternative would be to finance early retirement by hiring more young workers, paying them less than their marginal product, and supporting retirees out of the surplus. But it may be hard to find good younger workers, or the firm may face constraints in the product market.

3 Ironically, one of the most elegant pieces on the topic of public pensions (Sala-i-Martin 1996) is based on the fallacy that old persons are not only less productive than young ones, but that their mere presence in the workplace reduces the productivity of the young. In this case, there would be gains to removing the elderly from the labor force. If the externality is intra-firm, then the market will eliminate it as firms find it in their interest to institute pension arrangements. If the externality is inter-firm, then market forces will not eliminate it, and state action, in the form of a public pension scheme, is called for.

4 A simple regression predicted that, holding the investment rate constant, a one percentage point decline in the rate of labor force growth would lead to a 0.6 percentage point acceleration in the rate of productivity growth. Coincidentally, labor force growth in the United States is projected to decline by about one percentage point between 1990 and 2050.

5 According to this study, in a number of countries the prospective gains from rationalizing unemployment benefits for older work-

ers (recognizing that many older unemployed persons are in fact never going to work again, hence dealing with them through the pension system) are greater than the prospective gains from reforming public pensions.

6 In this review, I assume unless stated otherwise that a capital reserve-funded system is fully funded, in the sense that the present value of assets equals the present value of liabilities at all points in time. Most of the points made can be applied as well to a partially funded system. I also make no distinction (unless necessary) between public capital reserve-financed pension systems and private retirement savings; both amount to a generation's financing its own retirement by the accumulation of capital.

7 This is not quite true: the only pension system that fully eliminates redistribution, hence labor market distortions, is a system in which contributions are not only individually earmarked but accumulations can be passed along to heirs (otherwise, there is a redistribution from those who die early to those who live long).

8 Workers also probably feel that they have been compensated in the form of longer life.

9 Peterson (p. 137) comments that few American workers cite poor health as a reason for early retirement. I suspect that if the question were put to a panel of low-income workers, the result would be different.

10 Corsetti and Schmidt-Hebbel (1997) claim that in such countries a payroll tax of 20 percent could lead to half of all output being produced in the informal sector.

11 Much of the evidence casting doubt on the life-cycle hypothesis consists of studies showing that the elderly continue to save. US panel data show that, while the elderly decumulate nonhousing wealth (Hurd 1990: 613-614), they do not decumulate housing wealth (Venti and Wise 1989). Moreover, households headed by the elderly fail to dissave in Japan (Yamauchi 1997: 137) and Germany (Börsch-Supan 1991).

12 Assuming that the life-cycle hypothesis is relevant, what proportion of wealth at any point in time can be traced to within-genera-

tion life-cycle saving, as opposed to intergenerational transmission (transfers and bequests)? Estimates vary widely from 20 to 80 percent (Reil-Held 1999: Table 1 for references). Among the differences between studies are whether bequests are capitalized, the assumed difference in age between parents and children, and whether the purchase of consumer durables is treated as saving or consumption. In a micro-simulation study, Wolff (1999) finds that US household wealth (excluding Social Security and private defined-benefit pension plan wealth) is attributable in equal parts to saving, inheritance, and *inter vivos* transfers (i.e., two-thirds should be assigned to intergenerational transmission). Most striking, only about one-fourth of the first component is attributable to saving in the typical national income accounting sense, with the other three-quarters attributable to (inflation-adjusted) capital gains, that is, changes in the price of existing assets. These results refer to the birth cohort 1942–46; the role of capital gains can only have increased for this and all other cohorts since then. The point is that, even if the life-cycle hypothesis is valid, its significance may be limited.

13 Another problem with fiscal gloom-and-doom studies is that they do not typically take into account expectations and Ricardian equivalence (i.e., households' perception that government savings really belong to them). In a forward-looking, rational-expectations framework, the impact of population aging might be to increase private saving rates as young households anticipate that their pension benefits will be eroded by adverse demographic conditions. Mostly because of the prevalence of liquidity constraints, the hypothesis of full Ricardian equivalence has almost invariably been rejected. However, Roseveare et al. (1996; these authors do, to their credit, consider Ricardian equivalence) cite studies indicating that roughly one-quarter to one-half of an increment to the public-sector deficit in OECD countries is offset by an increase in private-sector saving, a nontrivial effect.

14 Specifically, Cutler et al. produced a baseline scenario in which the rate of labor force growth and the age structure were kept constant at their 1990 levels and compared this to an alternative scenario in which “news” arrived in the form of the actual demographic

projections of the US Social Security Administration. How, the authors asked, would an economic planner revise the planned rate of saving? For all plausible parameter values, the result was that the planner would reduce savings. They also examined the efficiency case for “tax smoothing”—instituting moderate tax increases now in order to reduce the magnitude of the tax increases necessary when the baby boomers retire—and found it to be weak. This result casts doubt on the wisdom of accumulating the US Social Security “Trust Fund.”

15 A more sophisticated interpretation is that, when a population ages, consumption of the current elderly rises by more than consumption of the current young falls. The reason is that the current young offload some of the consumption cuts necessary to free resources for transfer to the elderly onto future generations via the Ponzi-scheme nature of PAYG finance (Kotlikoff 1996: 4).

16 Schieber and Shoven project that private pension system benefits will start to exceed contributions in 2006. Investment income will allow real assets to continue to rise until 2024, at which point they begin to decline. The date of the switchover is, of course, sensitive, *inter alia*, to assumed pension contributions and the rate of return.

17 Increased savings will lead to increased investment if they raise the rate of return to physical capital or reduce its price. The latter will happen through increased equity prices if savers purchase equities, or through decreased interest rates if savers purchase government bonds. In both cases, wealth effects on asset holders will tend to increase consumption, giving rise to an offset. Lower government bond yields might also encourage government to borrow more in order to finance expanded consumption. All of these effects would operate in reverse when aged pensioners wished to convert their savings into consumption.

18 A precautionary motive would have the same effect as a liquidity constraint: if households felt that they would be unable to get their hands on retirement savings in the event of an emergency, they would not fully offset increments to pension wealth by drawing down nonpension wealth.

19 The silver lining to this cloud is that families lacking other forms of wealth do not,

for obvious reasons, engage in offsetting behavior, so imposition of mandatory pensions might tend to even out the distribution of wealth.

20 The addition of bequests might lead to further offsets if households that expect to receive bequests have a lower propensity to save (Weil 1996). A change in pension arrangements increasing the assets of the elderly might then affect the saving behavior of younger households.

21 The same offset applies to government measures to encourage the funding of private pension schemes. As Schieber and Shoven (1994) characterize it, one of the great ironies of recent economic history is that since the early 1980s US tax policy has explicitly discouraged firms from pre-funding the retirement of the baby boom generation, the reason being that government is reluctant to forgo tax revenues.

22 One might expect some of the clearest evidence of demographic impacts on asset prices to come from the housing market. Mankiw and Weil (1989) predict nearly a 50 percent fall in US housing prices by 2007 resulting from demographic effects. A contrary prediction is made by Börsch-Supan (1991) for most European countries, on the grounds that the flow of inherited housing may diminish because of longer life spans.

23 This discussion assumes perfect capital markets, however. The case for investing public pension funds in equities is much stronger if individual investors are liquidity-constrained or just ill informed. Geanakoplos, Mitchell, and Zeldes (1999) argue that if households that currently do not invest in equities were subjected to forced diversification through the US Social Security system, they would experience a substantial welfare gain.

24 This ratio holds for developed, that is to say, low-fertility societies. High-fertility societies have a young age distribution with a high proportion of young dependents, a circumstance that may depress savings.

25 In the United States, Social Security and the insurance value of Medicare account for about half of the income of persons over age 65 (US Council of Economic Advisers 1996) and for virtually all the income of the

elderly poor. For one-quarter of all elderly households in 1986, Social Security accounted for over 90 percent of income (Hurd 1990: 570).

26 The following example is based on Jackson (1998: 27–33); Disney (1996: 1–34) offers a slightly more complicated model from which the same point can be drawn. Let A represent the aged population, Y the young population, P the output per member of the young population (productivity), B the consumption per capita of the aged, and c the share of output consumed by the young population. Since by assumption all output is consumed, $PY = cPY + BA$, which can be solved to give $c = 1 - (B/P)(A/Y)$. If the dependency ratio A/Y rises while B remains the same, there need be no decline in c as long as P rises proportionally. Now let $B = bcP$, that is, let consumption of the aged be proportional to consumption of the young. In this case $c = 1/[1+b(A/Y)]$. Productivity has dropped out of the picture, and if the dependency ratio A/Y or the replacement rate b rises, the share of output transferred to the elderly must rise as well.

27 All of this should lend itself well to the formulation of an optimization program to maximize social welfare by fine-tuning the mix of PAYG and capital reserve financing. However, it turns out to be difficult to translate Samuelson–Aaron logic into real-world policy advice. Blanchet and Kessler (1991) examined the optimal mixture of PAYG and capital reserve financing in an aging population where factor returns are endogenous. The outcome was dominated by the assumed substitutability between consumption of successive cohorts in the social welfare function: if policymakers are concerned about the consumption of future cohorts, capital reserve financing is the answer; if not, PAYG financing is superior. The optimal policies emerging from the analysis require a degree of flexibility not likely to be feasible in the real world. Simple rules examined do not come close to optimal policies.

28 Peterson (pp. 120–121) expresses outrage that higher incomes might be used to justify higher tax rates, but surely real after-tax income is a reasonable welfare measure.

29 To illustrate the magnitude of the effect, Lee and Tuljapurkar (1997: 78) calculate for the US that each one-year increase in life

expectancy requires an increase in the payroll tax of 3.6 percent. Based on a current payroll tax rate of 12.6 percent, this translates into an increase of 0.43 percentage points. Roughly speaking, then, if life expectancy increases from its current level of 75 years to 85 years in 2030, the required payroll tax rate will be about 17 percent.

30 Blake and Orszag (1998) show that, among the major OECD economies, not a single PAYG pension system is actuarially viable if pensions rise at the rate of productivity growth, but all are viable if pensions are frozen at current real levels.

31 The specific question asked by the authors was how a globalization scenario, under which the geographic allocation of savings flows across investment projects changed in line with modern portfolio theory, would compare to an autarky scenario in which the current geographic allocation of savings was maintained. Two regions, North and South, were employed in the simulation. Taking 2030 as a reference year, GDP in the North was projected to be 2.6 percent lower in the globalization scenario than in the autarky scenario, while GNP (reflecting increased earnings on foreign assets) was 0.26 percent higher. The rate of return to capital in the North was increased by 0.4 percentage points, not a particularly significant change. Average annual public pension in-

come of the elderly in the North was reduced by \$400 (about 2.5 percent) because of the lower wage bill, but this loss was made up for by more rapid capital accumulation. This is an average; in fact, the well-to-do elderly would gain while the poor elderly would lose. Effects in the South were more consequential, with GDP being as much as 7.7 percent higher in the globalization scenario and GNP 1.9 percent higher. Global GNP was increased by 0.25 percent, an efficiency gain reflecting the improved global allocation of capital.

32 An obvious exception is the case of countries where escape to the informal sector is an option.

33 Alesina and Perotti (1997) find evidence that when labor unions are either very weak (so that they have no bargaining power) or very strong (so that they are engaged in constant dialogue with government and employers, as in Sweden), payroll taxes result in lower wages. It is when the situation is somewhere in the middle that payroll taxes result in rising unit labor costs. More generally, there is no rigorous case to be made in theory that the welfare state impairs macroeconomic performance (Atkinson 1997), nor is there consensus in the empirical literature on the relationship between the size of transfer programs and the rate of economic growth (see Buti, Franco, and Pench 1997: 17 for references).

References

- Aaron, H. J. 1966. "The social insurance paradox," *Canadian Journal of Economics and Political Science* 32: 371-374.
- Alesina, A. and R. Perotti 1997. "The welfare state and competitiveness," *American Economic Review* 87(5): 921-939.
- Arthur, W. B. and G. McNicoll. 1977. "Optimal time paths with age-dependence: A theory of population policy," *Review of Economic Studies* 44: 111-123.
- . 1978. "Samuelson, population, and intergenerational transfers," *International Economic Review* 19: 241-246.
- Atkinson, A. 1997. "The economics of the welfare state: An incomplete debate," European Commission, *The Welfare State in Europe: Challenges and Reforms*. *European Economy* No. 4: 45-60.
- Auerbach, A. J., J. Cai, and L. J. Kotlikoff. 1991. "U.S.: Demographics and saving: Predictions of three saving models," *Carnegie-Rochester Conference Series on Public Policy* 34: 135-156.
- Auerbach, A. J. and L. J. Kotlikoff 1987. *Dynamic Fiscal Policy*. Cambridge: Cambridge University Press.
- . 1990. "Tax aspects of policy towards aging populations: Canada and the United States," *National Bureau of Economic Research Working Paper* No. 3405. Cambridge, MA: NBER.

- Auerbach, A. J., L. J. Kotlikoff, R. P. Hagemann, and G. Nicoletti. 1989. "The economics of aging populations: The case of four OECD countries," *OECD Economic Studies* 12: 97–130.
- Bailliu, J. and H. Reisen. 1997. "Do funded pensions contribute to higher aggregate savings? A cross-country analysis," *OECD Development Center Technical Papers*, No. 130. Paris: OECD.
- Barr, N. 1992. "Economic theory and the welfare state: A survey and interpretation," *Journal of Economic Literature* 30(3): 741–803.
- Belan, P. and P. Pestieau. 1999. "Privatizing social security: A critical assessment," *The Geneva Papers on Risk and Insurance* 24(1): 114–130.
- Bernheim, B. D. and O. Stark. 1988. "Altruism within the family reconsidered: Do nice guys finish last?" *American Economic Review* 78: 1034–1045.
- Blake, D. and J. M. Orszag. 1998. "The simple economics of funded and unfunded pension systems," Pensions Institute, Birkbeck College, University of London.
- Blanchet, D. and D. Kessler. 1991. "Optimal pension funding with demographic instability and endogenous returns on investment," *Journal of Population Economics* 4: 137–154.
- Blöndal, S. and S. Scarpetta. 1999. "The retirement decision in OECD countries," *Economics Department Working Papers* No. 202. Paris: OECD.
- Börsch-Supan, A. 1991. "Implications of an aging population: Problems and policy questions in West Germany and the United States," *Economic Policy* 12: 104–139.
- . 1996. "The impact of population ageing on savings, investment, and growth in the OECD area," in OECD (ed.), *Future Global Capital Shortages: Real Threat or Total Fiction?* Paris: OECD.
- Browning, E. K. 1975. "Why the social insurance budget is too large in a democracy," *Economic Inquiry* 13: 373–388.
- Browning, M. and A. Lusardi. 1996. "Household saving: Micro theories and macro facts," *Journal of Economic Literature* 34(4): 1797–1855.
- Burtless, G. and B. Bosworth. 1998. "Privatizing Social Security: The troubling trade-offs," *Brookings Policy Brief* No. 14. Washington, DC: Brookings Institution.
- Buti, M., D. Franco, and L. R. Pench. 1997. "Reconciling the welfare state with sound public finances and high employment," European Commission, *The Welfare State in Europe: Challenges and Reforms*, *European Economy* No. 4: 7–42.
- Clark, R., J. Kreps, and J. J. Spengler. 1978. "Economics of aging: A survey," *Journal of Economic Literature* 16: 919–962.
- Corsetti, G. and K. Schmidt-Hebbel. 1997. "Pension reform and growth," in *The Economics of Pensions: Principles, Policies, and International Experience*, ed. S. Valdes-Prieto. Cambridge: Cambridge University Press.
- Costa, D. L. 1995. "Pensions and retirement: Evidence from Union Army veterans," *Quarterly Journal of Economics* 110: 297–320.
- Cutler, D. M., J. Poterba, L. Sheiner, and L. H. Summers. 1990. "An aging population: Opportunity or challenge?" *Brookings Papers on Economic Activity* 1990 1: 1–73.
- Deaton, A. S. and C. N. Paxson. 1997. "The effects of economic and population growth on national saving and inequality," *Demography* 34(1): 97–114.
- Disney, R. 1996. *Can We Afford to Grow Older? A Perspective on the Economics of Aging*. Cambridge, MA: MIT Press.
- Easterlin, R. A., C. M. Schaeffer, and D. J. Macunovich. 1993. "Will the baby boomers be less well off than their parents? Income, wealth, and family circumstances over the life cycle in the United States," *Population and Development Review* 19(3): 497–522.
- Ermisch, J. 1989. "Intergenerational transfers in industrial countries: Effects of age distribution and economic institutions," *Journal of Population Economics* 1: 269–284.
- Feldstein, M. 1996. "The missing piece in policy analysis: Social Security reform," *American Economic Review* 86(2): 1–14.
- Fischer, B. and H. Reisen. 1994. "Pension fund investment from aging to emerging markets," *OECD Development Centre Policy Brief* No. 9. Paris: OECD Development Centre.
- Fogel, R. W. and D. L. Costa. 1997. "A theory of technophysio evolution, with some implica-

- tions for forecasting population, health care costs, and pension costs," *Demography* 34(1): 49–66.
- Fougère, M. and M. Mérette. 1999. "Population ageing and economic growth in seven OECD countries," *Economic Modelling* 16: 411–427.
- Franco, D. and T. Munzi. 1997. "Ageing and fiscal policies in the European Union," *European Economy* 4: 239–388.
- Friedman, B. M. and M. J. Warshawsky. 1990. "The cost of annuities: Implications for saving behavior and bequests," *Quarterly Journal of Economics* 105: 135–154.
- Gale, W. G. 1995. "The effects of pensions on wealth: A re-evaluation of theory and evidence," manuscript. Washington, DC: Brookings Institution.
- Geanakoplos, J., O. S. Mitchell, and S. Zeldes. 1999. "Social Security money's worth," in *Prospects for Social Security Reform*, ed. O. S. Mitchell, R. J. Myers, and H. Young. Philadelphia: University of Pennsylvania Press.
- Gokhale, J., L. J. Kotlikoff, and J. Sabelhaus. 1996. "Understanding the postwar decline in U.S. saving: A cohort analysis," *National Bureau of Economic Research Working Paper* No. 5571. Cambridge, MA: NBER.
- Gruber, J. and D. Wise (eds.). 1999. *Social Security and Retirement Around the World*. Chicago: University of Chicago Press.
- Habakkuk, H. J. 1962. *American and British Technology in the Nineteenth Century*. Cambridge: Cambridge University Press.
- Heller, P. S., R. Hemming, and P. W. Kohnert. 1986. "Aging and social expenditure in the major industrial countries, 1980–2025," *IMF Occasional Paper* No. 47. Washington, DC: International Monetary Fund.
- Higgins, M. 1997. "Demography, national savings, and international capital flows," *Federal Reserve Bank of New York Staff Reports*, No. 76.
- Holzmann, R. 2000. "Can investments in emerging markets help to solve the aging problem?" manuscript. Washington, DC: World Bank.
- Hurd, M. 1990. "Research on the elderly: Economic status, retirement, and consumption and saving," *Journal of Economic Literature* 24: 565–637.
- İmrohroğlu, A., S. İmrohroğlu, and D. H. Joines. 1995. "A life cycle analysis of Social Security," *Economic Theory* 6: 83–114.
- Jackson, W. A. 1998. *The Political Economy of Population Ageing*. Cheltenham, UK: Edward Elgar.
- James, E. 1998. "New models for old-age security: Experiments, evidence, and unanswered questions," *World Bank Research Observer* 13(2): 271–301.
- Kohl, R. and P. O'Brian. 1998. "The macroeconomics of ageing, pensions, and savings: A survey," *OECD Economics Department Working Paper* No. 200. Paris: OECD.
- Kotlikoff, L. J. 1996. "Simulating the privatization of Social Security in general equilibrium," *National Bureau of Economic Research Working Paper* No. 5776. Cambridge, MA: NBER.
- Kotlikoff, L. J. and J. N. Morris. 1989. "How much care do the aged receive from their children? A bimodal picture of contact and assistance," in *The Economics of Aging*, ed. D. A. Wise. Chicago: University of Chicago Press.
- Laferrère, A. 1999. "Intergenerational transmission models: A survey," *The Geneva Papers on Risk and Insurance* 24(1): 2–26.
- Lee, R. D. and S. F. Lapkoff. 1988. "Intergenerational flows of time and goods: Consequences of slowing population growth," *Journal of Political Economy* 96: 618–651.
- Lee, R. D. and S. Tuljapurkar. 1997. "Death and taxes: Longer life, consumption, and social security," *Demography* 34(1): 67–81.
- Leimer, D. R. and P. A. Petri. 1981. "Cohort-specific effects of Social Security policy," *National Tax Journal* 24(1): 9–28.
- Lumsdaine, R. L., J. H. Stock, and D. A. Wise. 1997. "Retirement incentives: The interaction between employer-provided pensions, Social Security, and retiree health benefits," in *The Economic Effects of Aging in the United States and Japan*, ed. M. D. Hurd and N. Yashiro. Chicago: University of Chicago Press.

- MacKellar, L., T. Ermolieva, and H. Reisen. 1999. "Globalization, social security, and intergenerational transfers," *IIASA Interim Report IR-99-056*. Laxenburg, Austria: International Institute for Applied Systems Analysis.
- MacKellar, L. and W. P. McGreevey. 1999. "The growth and containment of social security systems," *Development Policy Review* 17: 5–24.
- MacKellar, L. and H. Reisen. 1998. "A simulation model of global pension investment," *Ageing Working Papers AWP 5.5*. Paris: OECD.
- Magnussen, K. A. 1994. "Old-age pensions, retirement behaviour and personal saving: A discussion of the literature," *Social and Economic Studies* 67. Oslo: Statistics Norway.
- Mankiw, G. and D. N. Weil. 1989. "The baby boom, the baby bust, and the housing market," *Regional Science and Urban Economics* 19: 235–258.
- Marchand, M., P. Michel, and P. Pestieau. 1996. "Intergenerational transfers in an endogenous growth model with fertility changes," *European Journal of Political Economy* 12: 33–48.
- Masson, P. and R. Tryon. 1990. "Macroeconomic effects of projected population aging in industrial countries," *IMF Staff Papers* 37(3): 453–485.
- McGarry, K. and R. F. Schoeni. 1995. "Transfer behavior in the Health and Retirement Study: Measurement and redistribution of resources within the family," *Journal of Human Resources* 30: S184–S226.
- Mitchell, O. S. and S. P. Zeldes. 1996. "Social Security privatization: A structure for analysis," *American Economic Review* 86(2): 363–367.
- Orszag, P. R. and J. E. Stiglitz. 1999. "Rethinking pension reform: Ten myths about social security systems," paper presented at the World Bank conference "New Ideas About Old Age Security," Washington, DC, 14–15 September.
- Poterba, J. 1998. "Population age structure and asset returns: An empirical investigation," manuscript, Department of Economics, MIT.
- Poterba, J. M., S. F. Venti, and D. A. Wise. 1997. "The effects of special saving programs on saving and wealth," in *The Economic Effects of Aging in the United States and Japan*, ed. M. D. Hurd and N. Yashiro. Chicago: University of Chicago Press.
- Reil-Held, A. 1999. "Bequests and aggregate wealth accumulation in Germany," *The Geneva Papers on Risk and Insurance* 24(1): 50–63.
- Romer, P. 1990. "Capital, labor and productivity," *Brookings Papers on Economic Activity: Microeconomics*: 337–367.
- Roseveare, D., W. Leibfritz, D. Fore, and E. Wurzel. 1996. "Ageing populations, pension systems, and government budgets: Simulations for 20 OECD countries," *OECD Economics Department Working Papers* No. 168. Paris: OECD.
- Rust, J. and C. Phelan. 1997. "How Social Security and Medicare affect retirement behavior in a world of incomplete markets," *Econometrica* 65(4): 781–831.
- Sala-i-Martin, X. 1996. "A positive theory of social security," *Journal of Economic Growth* 1: 277–304.
- Samuelson, P. A. 1958. "An exact consumption-loan model of interest with or without the social contrivance of money," *Journal of Political Economy* 66: 467–482.
- Schieber, S. and J. Shoven. 1994. "The consequences of population aging on private pension fund saving and asset markets," *National Bureau of Economic Research Working Paper* No. 4665. Cambridge, MA: NBER.
- Siebert, H. 1997. "Labor market rigidities at the root of unemployment in Europe," *Journal of Economic Perspectives* 11(1): 191–200.
- Simon, J. 1981. *The Ultimate Resource*. Princeton: Princeton University Press.
- Solow, R. 1956. "A contribution to the theory of economic growth," *Quarterly Journal of Economics* 70: 65–94.
- Turner, D. et al. 1998. "The macroeconomic implications of ageing in a global context," *OECD Economics Department Working Paper* No. 193. Paris: OECD.
- US Council of Economic Advisers. 1996. Annex to *Economic Report of the President, Transmitted to the Congress February 1996*. Washington, DC: US Government Printing Office.

- van Dalen, H. P. 1996. "Pitfalls in the economic analysis of aging," *Journal of Policy Modeling* 18: 158-184.
- van Solinge, H. et al. 1998. "Population, labour and social protection in the European Union: Dilemmas and prospects," *Netherlands Interdisciplinary Demographic Institute Report No. 52*. The Hague: NIDI.
- Venti, S. and D. A. Wise. 1989. "Aging, moving, and housing wealth," in *The Economics of Aging*, ed. D. Wise. Chicago: University of Chicago Press.
- Wise, D. A. 1997. "Retirement against the demographic trend: More older people living longer, working less, and saving less," *Demography* 34(1): 83-95.
- Wolff, E. N. 1999. "Wealth accumulation by age cohort in the U.S.: 1962-92: The role of savings, capital gains and intergenerational transfers," *The Geneva Papers on Risk and Insurance* 24(1): 27-49.
- Weil, D. 1996. "Intergenerational transfers, aging, and uncertainty," in *Advances in the Economics of Aging*, ed. D. A. Wise. Chicago: University of Chicago Press.
- Willmore, L. 1998. "Social security and the provision of retirement income," *Pensions Institute Discussion Paper PI-9805*, Birkbeck College, University of London.
- Yamauchi, N. 1997. "The effects of aging on national saving and asset accumulation in Japan," in *The Economic Effects of Aging in the United States and Japan*, ed. M. D. Hurd and N. Yashiro. Chicago: University of Chicago Press.

KEN DYCHTWARD

Age Power: How the 21st Century Will Be Ruled by the New Old

New York: Tarcher/Putnam, 1999. xix + 266 p. \$24.95.

Ken Dychtwald is a practical expert on population aging who has written extensively and become a public speaker on the topic. A gerontologist with medical knowledge, he tells us about the numbers of people involved, their economic means and position, their physical, mental, and health condition, and their situation in the political, social, ideological, familial, and community life of the contemporary United States. Dychtwald goes on to forecast how all of these circumstances will appear 15 or 20 years hence, when the huge cohorts born in the years after World War II come to be the old—the “new old,” as the author calls them. Except for Dychtwald’s final, quasi-prophetic assertions, nearly all this material is common knowledge to geriatricians and gerontologists, but it is very useful to have it spelled out in clear, authoritative form. It would be gratifying to be able to recommend the book to demographers and to those concerned with socioeconomic development as an accessible collection of information highly relevant to both these bodies of experts. Such a recension does not seem to be readily available elsewhere, especially accompanied by the shrewd and insightful comments that are found here.

Unfortunately, however, Dychtwald’s ignorance outside his own territory and his weakness, indeed his eccentricity, as a social theorist make such a recommendation impossible. So uncertain is his grasp of demography that he seems to believe that expectation of life denotes only a measure reckoned at age 0, so that e_{50} , e_{60} , e_{70} , and so on, statistics that would be very useful to his arguments, are apparently unavailable to him. The confusion may go even deeper, for he actually affirms (on p. 206) that “life expectancy at 65 is higher than at birth.” His historical knowledge is less conspicuously at fault, but he defends a dubious proposition that may mislead readers living in or concerned with developing countries, eager as they understandably are to compare their position with that of Western societies, especially the American, when those societies had yet to industrialize.

This proposition is that the old—here one must call them the “old old”—were in a ruling position in the traditional Western social order before modern industrial development, a hegemony apparently to be inherited by the “new old.” Commanding as was the position of heads of family in the economic activity of that bygone order, and imperative as was its ideology in requiring obedience to parents and respect to all seniors, this did not give the tiny numbers of superannuated individuals anything resembling full control of the populations of colonial North America or of preindustrial England in social, political, or even economic matters. Seniors, ordinarily much older than heads of working-age groups, advised, warned, and gave important information to and accepted unceasing deference from the populace at large, but they did not rule.

But it is the crude, quasi-theoretical general argument of the book, as well as the casual language often used, that is likely to make it unacceptable to social scientists confronting the issues raised by the rapid aging of contemporary populations, both developed and developing. Dychtwald thinks that the sheer numerical weight of these 40-to-50-year-olds, whose numbers indeed distinguish them from all their predecessors and their successors, confers on them an independent life,

an outlook, and a policy. He wants us to believe that when these baby boomers reach old age and become the “new old,” their power will have grown to such an extent that they will rule the whole society, in a way analogous presumably to the way in which it is wrongly believed the “old old” ruled colonial America.

Perhaps the best way to deal with these unproven and unprovable assertions is to reject them out of hand. Important as it is to study the impact of the baby boomers on the United States, particularly at the various stages through which they will pass on their way to old age, and to gauge the possibility that this impact will increase over the life course, the picture painted by Dychtwald has to be called wholly implausible. Social structures are simply not constructed in the way that he has assumed; political power is not distributed in the supposed fashion, and accession to sovereignty does not occur as is implied. In any event it could never inhere in the oldest members of the population. It is difficult to understand why so accomplished a researcher could ever have believed in the picture that he has sketched. Some influence may well have come from the journalists quoted so extensively in his book, sources replete with superficial and misleading arguments about aging and the contemporary old, often expounded in the vulgar slang that frequently mars Dychtwald’s prose. A straightforward judgment might be that it is a serious mistake to try to reach a general readership by making use of banal arguments set out in familiar, conversational phraseology. But the case does not end here, at least for demographers.

Dychtwald has taken from demography the concept of the cohort and has misused it in a bizarre fashion. This unfortunate circumstance vividly illustrates the continuing failure of demography and its practitioners to convey their message to those for whom it is important, and indeed to the whole body of persons affected by any issue that requires demographic analysis. It is no easy task to suggest a strategy that would ensure that authorities such as Dychtwald learn enough about population and the principles of its study to prevent their falling into the theoretical morass I have alluded to above. Perhaps *Population and Development Review* should seek to extend its appeal over an even greater span of knowledge and professional avocation.

*Cambridge Group for the History
of Population and Social Structure*

PETER LASLETT

RICHARD LEETE (ED.)

Dynamics of Values in Fertility Change

Oxford: Oxford University Press, 1999. xiv + 378 p. \$85.00.

In his “Conclusions” to *Dynamics of Values in Fertility Change*, John Casterline writes that the goal of this volume is to take a major step toward meeting “the challenge of establishing values in their rightful place in research on fertility” (p. 357). An obvious question, of course, is what this “rightful” place might be. One clear answer was provided nearly 40 years ago by Kingsley Davis, and his view discouraged a generation of fertility researchers from giving serious attention to values. He wrote:

As for the so-called values, they should be recognized as being a part, or aspect, of the behavior itself and, accordingly, as requiring to be explained rather than being used as the explanation.... By definition, nobody does anything voluntarily without some purpose, however vague, in mind. The question of change or persistence is therefore a question of what did or did not act upon the total action (motive-plus-conduct).... In other words, to say that fertility continues to be high in some group because of the group's "high-fertility values" is like saying that birds fly because they have wings. (Davis 1963: 354)

The publication of this IUSSP volume, which includes chapters by several prominent fertility researchers, suggests that Davis's position is being challenged.

Despite the impression given by the book's title, that values play an important role in fertility change, the views of several contributors seem to be closer to the opinion expressed by Davis. In a nicely reasoned chapter on fertility levels among Muslims living in Israel, Calvin Goldscheider argues that family values do encourage large families, but concludes that "values do not operate in a social and political vacuum but are variables that respond to political-economic and demographic contexts. Values are reinforced and reconstructed as these contexts change" (p. 327). In other words, focusing only on values will yield scant insight into fertility behavior.

Three chapters argue that it is more important to examine how behavior affects values than to focus on the role of values in shaping fertility. Ronald Rindfuss and colleagues make this point when they examine changes in labor force participation of mothers with young children and changes in attitudes regarding the effects on children of such participation. They show that changes in women's behavior preceded changes in societal attitudes, suggesting that attitudes were altered to reduce conflict between beliefs and behavior. Similarly, a study of southern European families living in Australia, by Gigi Santow and Michael Bracher, found that fertility fell rapidly in advance of significant change in traditional family values. They note that having smaller families may produce changes in attitudes toward the family, and conclude that "the demographer's flow chart, with an arrow leading from a box called 'values' to a box called 'fertility', is a gross over-simplification if not, in some cases, simply wrong" (p. 70). Finally, Robert Retherford and colleagues echo Kingsley Davis in the conclusions they reach from examining fertility change in post-World War II Japan. They argue that the same social and economic changes that reduce fertility also drive changes in values, and value change tends to lag behind fertility change. Given a lack of consensus by the contributors to this volume regarding the place of values in fertility research, it appears that the question of its "rightful place" is still open.

It seems obvious that a book on values must grapple with the issues of what is meant by values and how they can be measured. Debra Friedman and colleagues address these questions in an opening chapter. They differentiate values from norms, attitudes, or preferences by stating, "Values are relatively general and durable internal criteria for evaluation" (p. 21). Given that they conceptualize values as internal and unobservable, they discuss the major problems that empirical research faces in studying them. This initial attempt to advance definitional clarity does not influence the remainder of the volume: apparently no effort was made to have the authors of individual chapters adhere to any common definition of values. Many of the variables discussed in the volume seem to fit in the category of

preferences: John Simons on ideal family size, Carla Makhlouf Obermeyer on son preference, Retherford et al. on gender role preference; or the category of attitudes: Gijs Beets et al. on the duty of parents to children and Rindfuss et al. on the effects of mothers working on their children.

One should expect to achieve useful results from bringing together good researchers to discuss fertility theory. Therefore, it is not surprising that this volume contains much interesting material. Collectively the chapters provide information on fertility change in a broad array of cultures and over different time periods. A sample of topics (in addition to those already noted) includes the relationship between changes in values and changes in fertility in Western countries in the 1980s (Simons), how fertility attitudes change over the life course (Beets et al.), and effects of parental son preference on fertility in Morocco (Obermeyer). In addition, several chapters deal with the important topic of diffusion of ideas through television and social networks. From these diverse studies, fertility researchers are likely to glean ideas that will be useful in their own work. I would be surprised, however, if this book significantly increases the status of values as an important independent variable in the study of fertility change.

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Reference

Davis, Kingsley. 1963. "The theory of change and response in modern demographic history," *Population Index* 29(4): 345-366.

DONALD T. CRITCHLOW

Intended Consequences: Birth Control, Abortion, and the Federal Government in Modern America

New York: Oxford University Press, 1999. x + 307 p. \$30.00.

My first reaction to this book was: Who is this fellow Critchlow and how did he dig up so much inside information on the people and events so intimately depicted? The fascination comes not from the familiar political history of the family planning movement in the United States that he recounts quite objectively, but rather from the many behind-the-scenes glimpses of the personal interactions that influenced them. The 57 pages of notes at the end of this scholarly volume indicate that many of the sources are in unpublished memoranda and correspondence in the files of foundations and individuals who shaped this slice of history. For anyone who has been involved in this field for the last 25 to 50 years, reading this book is like going back for a class reunion. Virtually all of the characters are familiar and evoke a range of pleasant and occasionally not-so-pleasant memories. Critchlow is identified in the book as a historian and founding editor of the *Journal of Policy History* who worked on this project while a fellow at the Woodrow Wil-

son International Center for Scholars in Washington, DC. He has also published a related book, *The Politics of Abortion and Birth Control in Historical Perspective* (1996).

The author traces the origins of the family planning movement to concerns of various citizens and constituencies with overpopulation, poverty, welfare, and women's rights. The book draws its title from Critchlow's assessment that organized family planning programs did indeed reduce population growth, especially in developing countries, although they had few discernible effects on reducing either poverty or the proportion of out-of-wedlock births in the United States.

A great deal of attention is devoted to the political sensitivities of the occupants of the White House, particularly Presidents Lyndon Johnson and Richard Nixon, especially their concerns about relations with the Catholic hierarchy. In general, the federal government was slow to respond to the variety of pressures to provide financial support for family planning programs. The Catholic Church, a major obstacle in this struggle, reluctantly accepted the inevitability of contraception as a legitimate public demand, while it displayed unyielding opposition to the federal funding of induced abortion. Some radical black groups were in fact more vehemently opposed to family planning than the Catholic Church as late as the 1970s, for political reasons related to arguments of genocide.

In many ways, *Intended Consequences* is an account of the influence of John D. Rockefeller 3rd on the history of the population and family planning field. Critchlow recounts this story well: the transition from Rockefeller's concerns about overpopulation to his founding of the Population Council, his chairmanship of the Commission on Population Growth and the American Future, and his late conversion to the importance of economic development in the third world, the status of women, legalized abortion, and sex education. All of this is recounted with insight into the man's character and style, particularly his relentless pressures on the White House and some Catholic leaders. Rockefeller's support for abortion reform came with a political price tag, as Critchlow notes: "One of the great ironies of the success of abortion reform was that it shattered bipartisan support for federal family planning policy and helped take population control off the presidential agenda." Indeed, the recommendation of the Commission to promote the liberalization of abortion laws was clearly the most politically vulnerable part of the 1972 report, as Nixon's negative evaluation of it showed. (In fact, General William Draper, an influential and well-known population activist, tried unsuccessfully to persuade Rockefeller to duck the issue in the Commission report in deference to its more basic population messages.)

This book will intrigue the insiders in the population and family planning community. There are some errors: a confusion of replacement fertility with zero population growth (p. 150); a reference to Carmen Miró from Panama as a Brazilian demographer (p. 283); repeated references to Rei [Reimert] Ravenholt as Raymond; and other problems with names. But it is really quite remarkable that the author—a name unknown in this field—managed to capture so much of the flavor of the times and to fashion an exciting, coherent story.

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BERNARD JEUNE AND JAMES W. VAUPEL (EDS.)

Validation of Exceptional Longevity

Odense: Odense University Press, 1999. Odense Monographs on Population Aging 6. 249 p. \$25.00.

This collection of 15 chapters offers a wide scope of studies on human longevity conducted by 23 contributors from Europe and North America. Among the international team of authors are such established scholars as Michel Allard (France), Bertrand Desjardins (Canada), Bernard Jeune (Denmark), Väinö Kannisto (Portugal), Peter Laslett (UK), Thomas T. Perls (USA), Michel Poulain (Belgium), Jean-Marie Robine (France), A. Roger Thatcher (UK), James W. Vaupel (Germany), and John R. Wilmoth (USA).

The main intent of the authors is to develop rigorous scientific methods for validating claims of exceptional human longevity and to apply them systematically to both historical and contemporary data. Millions of people are fascinated with the *Guinness Book of Records*, which claims to provide verified information on longevity records, more accurate than the sensational claims made in newspapers and on television. The authors demonstrate that public opinion on human longevity issues is misled by the *Guinness Book* and that even the most “irrefutable” cases simply do not hold water. For example, Pierre Joubert, who appeared in the *Guinness Book* as a 113-year-old man, in reality died at age 65, whereas his namesake—his son—died 48 years later. After careful age verification, the average lifespan of most of the alleged “centenarians” proved to be 88 years.

The authors argue that even such leading scholars and eminent skeptics of the past as Bacon, Locke, Harvey, Haller, Temple, and Quételet were astonishingly gullible about claims of exceptional longevity. Laslett, for example, refers to “the cult of centenarians” to describe the complete loss of critical perception in the face of the emotional fascination with such claims. The authors concur that the history of human longevity is a history of myths. Moreover, they make the provocative claim that genuine centenarians probably never existed at any time in human history until the end of the nineteenth century.

It is not surprising that this provocative hypothesis has initiated intensive discussion among other researchers. These discussions about the book reveal two related aspects of the problem: (1) it may be true that there is no sufficient evidence for exceptional longevity in the past, but (2) there is also no sufficient evidence to claim that centenarians never existed before the nineteenth century—we simply do not know that to be the case.

One of the paradoxes of this book is that the authors, being critical of the previous claims of exceptional longevity, are at the same time rather defensive for their own examples of centenarians. The volume contains extensive documentation intended to prove the following three cases of exceptional human longevity: (1) Jeanne Calment, a French woman from Arles in southern France. She was born on 21 February 1875 and died on 4 August 1997 at the age of 122 years. Her case is described in a chapter by Robine and Allard. (2) Marie Louise Meilleur (née Chassé), who was born on 29 August 1880 in Kamouraska, French Canada, and died on 16 April 1998 at the age of 117 years. Her case is described in a chapter by Desjardins. (3) Christian Mortensen, a Danish-born American citizen, who

was born on 16 August 1882 and died on 25 April 1998 at the age of 115 years. His case is described in a chapter by Skyttthe, Jeune, and Wilmoth.

The 122-year lifespan of Jeanne Calment is particularly provocative because it stands so far apart from the previous validated longevity record (117 years, for Marie Louise Meilleur). It is known that, with the extensive systematic collection of any kind of records, every new record is typically very close to the previous ones. Moreover, the increment between progressive records is continuously decreasing with growing numbers of accumulated records. This empirical observation is supported by the mathematical theory of extreme value distributions, known as statistics of extremes (Gumbel 1958). The outstanding case of Jeanne Calment is a clear violation both of previous experience in record registration and of the predictions of probability theory.

The problem with the Calment case does not lie in her extreme longevity per se, since there seems to be no fixed theoretical limit to the duration of human life (Gavrilov and Gavrilova 1991). The real problem is the absence of a previous history of validated longevity records in the range of 118–121 years that should be expected in abundance if we accept the veracity of Calment's age of 122 years. One hopes that further studies will help to resolve this controversy.

This book should be of interest not only to specialists in longevity and genealogical studies, but also to the general reader. Demographers may particularly enjoy reading the chapter by Kannisto on assessing the information on age at death of very old persons in official vital statistics of various countries.

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References

- Gavrilov, L. A. and N. S. Gavrilova. 1991. *The Biology of Life Span: A Quantitative Approach*. New York: Harwood Academic Publishers.
- Gumbel, Emil J. 1958. *Statistics of Extremes*. New York: Columbia University Press.

SHORT REVIEWS

by Ann E. Biddlecom, John Bongaarts, Martin Brockerhoff, Susan Greenhalgh, Geoffrey McNicoll

RODERIC BEAUJOT***Earning and Caring in Canadian Families***

Peterborough, Ontario: Broadview Press, 2000. 416 p. \$19.95 (pbk.).

This well-researched, data-packed study of Canadian families has much to offer students of family change occurring throughout the industrialized world. Accepting the prevalent view that family life is being deinstitutionalized, the author, professor of sociology at the University of Western Ontario, interprets this process through a focus on earning and caring, the basic instrumental and expressive activities of the family. Arguing that transformations in the wider society are eroding the grounds for complementarity in men's and women's roles, and encouraging roles based on companionship instead, his special contribution is to widen the study of gender to give men's perspective a fairer hearing. The results are quite interesting and at times surprising. In chapters on gender, family change, paid work, unpaid work, fertility, children and youth, and family policy, Beaujot introduces substantial data suggesting that, in some areas, men have faced bigger changes and conflicts than women. For example, in the last decade, the proportion of women aged 25–44 working full time remained stable, while that of men declined by just over 10 percentage points. Eighty percent of women, but also 70 percent of men, were torn between the demands of job and family. (These latter data come from the United States.) Apparently written as a textbook—the style is dry and academic, the tables, figures, and boxes abundant—this ambitious study provides a detailed statistical portrait of the changing Canadian family while also examining general propositions about the relations between economic and family change, conflict and cooperation, men and women, adults and children. List of references, subject and author indexes.—S.G.

GARETH DALE AND MIKE COLE (EDS.)***The European Union and Migrant Labour***

New York and Oxford: Berg, 1999. ix + 323 p. \$65.00.

This book aims to analyze immigration control policies in the European Union in the 1990s from a Marxist perspective. Yet it scarcely applies a Marxist paradigm—analyzing the actions of capital, labor, and the state in close relation—instead reciting a litany of abuses inflicted on immigrants arriving from nonmember states. Many chapters offer a damning indictment of the EU's policies regarding immigration. Gareth Dale, the coeditor and author of three chapters, argues that current fears of an increasing

volume of non-EU immigrants or their displacement effects on native workers—fears fueled by newly ascendant political parties, as in Austria, as well as labor unions—are groundless. Levels of immigration to Europe are comparable to or lower than those in the 1950s and 1960s, and EU member countries have effectively restricted immigration from poor countries. In other chapters, Jon Gubbay points to the blatant incongruity of EU pronouncements that espouse humanitarian principles as a basis for non-discriminatory immigration policies with the reality that the EU has become an active agent in legitimizing policies of migration control in which race figures most prominently. Nigel Harris notes that the international movement of labor remains circumscribed despite trends in globalization, and calls for policies that conform to the spirit of universal morality. Mark Haynes builds on the “Fortress Europe” concept to predict that the EU will develop a stronger system of immigration control insofar as a regional immigration policy is feasible. These essays do not lend hope that a more unified Europe will serve the interests of less developed countries.

The strength of this book lies in case studies of several EU-member countries. They muster evidence, for example, that the Irish economic boom of the 1990s has involved the immigration of only a few thousand non-Irish laborers, contrary to media claims that the country is being flooded with refugees. In contrast, Germany has experienced proportionately more net immigration than the United States in the 1990s, and political leaders such as Chancellor Gerhard Schröder have continued the xenophobic scapegoating of immigrants practiced by their political predecessors. Likewise in France, successive governments have welcomed labor migrants in periods of shortage of the low-skilled labor force, but they have pursued illegal immigrants to appease nationalistic sentiments of the citizenry. In Austria, discrimination against immigrants is favored not only by conservatives but also by social democrats. Italy has been transformed from a “trampoline” for immigrants on their way to northern countries into a country of permanent residence for many of these people. The 1998 immigration law in Italy—according to which immigrants can receive a renewable five-year permit that is revocable at any time—may be a harbinger of comparable policies in other countries, and in the EU generally, as flexible means of manipulating labor immigration for the benefit of EU-member countries are developed in the next few years. All of the country case studies richly detail historical policies of immigration. In sum, these chapters demonstrate convincingly that the EU’s policies to induce labor movement will likely benefit only those immigrants from member countries. Index.—M.B.

ANDREW DOBSON (ED.)

Fairness and Futurity: Essays on Environmental Sustainability and Social Justice
Oxford: Oxford University Press, 1999. xi + 328 p. \$72.00; \$19.95 (pbk.).

In this neatly titled collection political philosophers and environmentalists struggle with the problems of sustainable development, environmental protection, and inter-generational justice. Many of the problems discussed are conceptual. Sustainability in one sense can be compatible with sustained growth; in another, stronger sense it requires maintenance of “natural capital”—itself a problematic concept with intractable measurement difficulties. Bryan Norton, asking what is to be sustained, usefully distinguishes between the wherewithal needed to assure the welfare of future genera-

tions and the actual physical “stuff” that underlies the environmental amenities and services we currently draw on. Preservation of the latter, he thinks, should be the aim. Wilfred Beckerman argues that “sustainable development” does not yield inter-generational egalitarianism—which anyway is not a defensible objective—and that our main obligation to future generations should be to bequeath a “decent” society and just institutions. Brian Berry, far removed from such a calculus, asserts that “people behave wrongly if they act out of a wrong attitude to nature.” Other essays deal with the application of Rawlsian theory to justice between generations and with the regressive nature of environmental taxes (for instance, energy taxes). In a concluding chapter Koos Neefjes of Oxfam displays some understandable impatience with the scholastic tone of most of the contributions and their implied conditions of peace, functioning political systems, and availability of the resources needed to implement environmental policies. He recounts the very different circumstances and problems facing various countries such as Rwanda, Sierra Leone, and Sudan. Consolidated bibliography, index.—G.McN.

JEAN DRÈZE (ED.)

The Economics of Famine

Cheltenham, UK: Edward Elgar, 1999. xxvi + 544 p. \$215.00.

Nineteen articles and book chapters from the 1980s and 1990s are assembled under two headings: famine analysis and case studies. The first group begins with Martin Ravallion’s 1997 review article from the *Journal of Economic Literature* and Amartya Sen’s first presentation (1981) of the now almost standard interpretation of famine as an entitlement failure. Much of the rest of the section, indeed of the volume, celebrates, elaborates, and applies Sen’s theoretical approach. Drèze has little time for supporters of “the ‘food availability’ fallacy”: “The fact that such a simple conceptual framework as the entitlement approach has caused so much confusion in development studies is a sad reflection on the state of the discipline.” However, the reservations of Alex de Waal from *Development and Change*, 1990, are allowed as pertinent. The case studies include famines in Ireland, the Soviet Union, India, Bangladesh, China, Ethiopia, and Malawi, and more general studies of historical Europe and contemporary Africa. The Soviet study is the demographic analysis of famine mortality during collectivization by Massimo Livi-Bacci from *PDR* 19, no. 4. The volume is in the series International Library of Critical Writings in Economics. Other titles in the same series, on aging, the family, economic demography, and the economics of population, were noticed in *PDR* 22: 170; 23: 438; 24: 405–406; and 24: 407.

JAMES W. HUGHES AND JOSEPH J. SENECA (EDS.)

America’s Demographic Tapestry: Baseline for the New Millennium

New Brunswick, NJ: Rutgers University Press, 1999. vii + 228 p. \$50.00; \$20.00 (pbk.).

The rate of natural population growth in the United States has dropped to a fraction of one percent per year, but profound demographic change continues. This volume contains 12 essays that describe various dimensions of ongoing demographic

transformations and discuss both their social and economic consequences and their implications for public policy. Macro-demographic trends are among the key topics addressed. As concern about growth in overall numbers has waned, other issues have become increasingly significant. A principal example is population aging—the inevitable result of past declines in fertility and mortality—and the challenges posed to the economy and to government by the projected growth of the elderly and their needs. A second area of concern is the changing family and its effects on the welfare of children. Declines in fertility and marriage and rising rates of divorce and female labor force participation have led to diverse living arrangements, with the traditional nuclear family having declined in importance. A third subset of essays addresses issues of cultural, socioeconomic, and ethnic diversity and legal and illegal migration patterns. Finally, two brief contributions describe global population trends and their economic and environmental impact.

Although only loosely integrated and of variable length and quality, most essays provide concise overviews of specific topics and provide an introduction to major demographic issues for the general reader; scholars looking for in-depth treatment will have to turn elsewhere. Index.—J.B.

ROBERT D. KAPLAN

The Coming Anarchy: Shattering the Dreams of the Post Cold War

New York: Random House, 2000. xix + 198 p. \$21.95.

All but one of the nine essays in Robert Kaplan's *The Coming Anarchy* have been published previously, and several of them have received attention in policy and development circles, notably the 1994 *Atlantic Monthly* article from which this book draws its title. This influential article was based largely on the author's observations in the early 1990s in Sierra Leone—a rather unrepresentative sample even of Africa, let alone global humanity. It portrayed a less developed world of surging, restless urban populations, increasing terrorism, impending environmental catastrophe, and dissolving statehood. In two more recent essays, titled "Was democracy just a moment?" and "Proportionalism: A realistic approach to foreign policy," Kaplan offers a Hobbesian prescription for how United States foreign policy should address the aforementioned problems in poorer countries. His proposals include accepting enlightened despotism in many countries rather than promoting democracy among uneducated masses, avoiding peace-keeping operations, and renewing emphasis on population control. In these and other essays, Kaplan is given to unflattering caricatures of Africans and Asians—a penchant that has not endeared him to many readers. Yet, he also grounds his arguments impressively in political theory, and recent events in some countries show his prescience regarding social dynamics in the new world order.

Kaplan's vision of a supposedly coming global chaos is based in no small part on the population problems he perceives, including uncontrolled urbanization, mortality from infectious disease, rural exodus, and excess fertility. Peculiarly, his work has received little critical comment among population and health specialists, save for polemical rebuttals from reproductive health advocates (for instance, by Betsy Hartmann in *Environment and Urbanization*, October 1998) and some thoughtful

reviews of his 1996 book, *The Ends of the Earth* (see Geoffrey McNicoll in the September 1996 issue of this journal). *The Coming Anarchy* provides an overview of Kaplan's position on population change, and readers should be advised to not take his assertions on population very seriously; Kaplan has a limited understanding of basic demographic history, concepts, and statistics. Several essays point to rapid urbanization, for instance, as an impetus for war and violence and counterproductive for economic development, while historical evidence supports an opposite interpretation. Kaplan misconstrues an urbanization level as reflecting the population living in cities, whereas the vast majority of urbanites in less developed regions live in towns. He maintains that suburbanization will make American communities increasingly segregated by race and class, though the growing movement of immigrants and middle-class African Americans from central cities to suburbs is clearly making these areas more diverse, and certainly more heterogeneous than one would have conceived prior to the civil rights and immigration acts of 1964 and 1965.

Inaccuracies aside, the lively essays in this book are recommended to development specialists, if only to gain a fuller appreciation for the interest and debate these writings have stirred among policymakers. Index.—M.B.

MATTHEW LOCKWOOD

Fertility and Household Labour in Tanzania: Demography, Economy, and Society in Rufiji District, c. 1870–1986

Oxford: Clarendon Press, 1998. xiii + 203 p. \$65.00.

This book examines fertility change in Rufiji district, Tanzania (Part I) and the contemporary consequences of fertility for household and individual labor and wealth (Part II). In the first part of the book, Lockwood draws on the proximate determinants framework to explain historical fertility change in this coastal area of Tanzania. Fertility has been relatively low, and is the lowest in the country outside the capital city of Dar es Salaam. The analysis is supplemented by a review of changes in social and economic institutions over the past century, namely, the emergence of a colonial economy, the spread of Islam (Rufiji remains the most uniformly Islamic part of rural Tanzania), and migration to the capital.

Part II examines the idea, advanced early in the last century by Chayanov, that household composition plays an important role in determining the scale and intensity of economic activity. Lockwood points out that Chayanov's model is not relevant for much of Tanzania since agricultural land is in short supply and labor markets are for the most part open. However, Rufiji district meets the requisite assumptions of a land-abundant agrarian economy; thus we have a case study that is relevant for testing the theoretical model but one that is not very reflective of the conditions in most of Tanzania. Lockwood's empirical analyses are based on a survey of households, a series of interviews on time-use, birth, and marriage histories, and interviews with previous migrants to Dar es Salaam and parents of current migrants. Description of the data and of problems encountered in the field is refreshingly thorough (e.g., the manner in which local authority structures were involved in selection of the study sample, or difficulties in classifying time-use activities).

Lockwood finds little support for a Chayanovian model of rural economies. The gender composition of households rather than their age composition or size matters more for household labor allocation. Indeed, gender is an underlying theme throughout the book, particularly the different roles men and women assume in agriculture and the repercussions for theoretical models based on a unified household or life cycle. While many details are provided about the nature of agricultural activities, bolder statements about how men's and women's interests conflict within households are often left without supporting evidence. The conclusion—just over two pages—is a missed opportunity to unite the sometimes disparate analyses in the book. Despite these weaknesses, the study is a thorough theoretical and empirical treatment of fertility change and its economic consequences for households in an African society. Index.—A.E.B.

YAHYA M. SADOWSKI
The Myth of Global Chaos

Washington, DC: Brookings Institution Press, 1998. xv + 267 p. \$28.95 (pbk.).

A succession of influential articles and books have portrayed the post-Cold War world as beset by conflict and anarchy, rooted in the reemergence of primordial tribal hatreds, religious enmity, cultural anomie, environmental scarcity, and the ill effects of globalization. They include Robert D. Kaplan's *Balkan Ghosts* and "The coming anarchy," William Pfaff's *Barbarian Sentiments* and *The Wrath of Nations*, Samuel P. Huntington's "The clash of civilizations?," Benjamin R. Barber's *Jihad vs. McWorld*, and Daniel Patrick Moynihan's *Pandaemonium*. Together, the somewhat disparate arguments presented in such writings are termed by Yahya Sadowski global chaos theory. Sadowski sees them as important not because they have underlain or suggested any new grand strategy for the US but because they represent "a piecemeal assemblage of epigrams" that has influenced the way many people think about the world: "Their soundbites were popular in all the major branches of government." (Apropos of the Pentagon, however, he remarks that "Torn between the allure of ethnic conflicts as a justification for defense budgets and the perceived hopelessness of participating in them, the Department of Defense split the difference. Its reports increasingly invoked ethnic wars, transnational threats, and humanitarian emergencies—but when confronted with practical decisions about whether to become involved in Rwanda or Bosnia, the military routinely voted no.")

In *The Myth of Global Chaos* Sadowski summarizes these arguments and examines the evidence for them. His main data are a listing of low-intensity conflicts since 1980, each determined (somewhat arbitrarily) to be culturally based or not. Thus the UNITA insurrection in Angola is classed as a culture conflict, the RENAMO insurrection in Mozambique is not. He finds that culture conflicts are no less frequent in rich than in poor societies, though they are markedly less lethal in the former. They are less frequent in countries with higher levels of economic freedom. They are not associated with multiethnic composition of population, with Western media penetration, or with foreign investment. Very few can be seen as

Huntington-style clashes of civilizations. Over the period since World War II there does not seem to have been a secular increase in conflicts, and there has been no greater increase in the proportion of civilian casualties in culture conflicts than in other forms of low-intensity conflict. (UNICEF data show war deaths in developing countries averaging around 400,000 per year since 1945 with no apparent trend.) Particular instances of culture conflict that are commonly traced to primordial antipathies—the Balkans, Rwanda—are shown to fit the case poorly. The argument is not that ethnic or cultural nationalisms do not exist, but that they are pliable and subject to political manipulation. In remarkably short order, identities can be created; equally, they can dissolve. A more complex and nuanced view of what is going on in the world is called for. The author is with the Johns Hopkins School of Advanced International Studies. Index.—G. McN.

JOHN B. WILLIAMSON, DIANE M. WATTS-ROY, AND ERIC R. KINGSON (EDS.)
The Generational Equity Debate

New York: Columbia University Press, 1999. xii + 263 p. \$49.50; \$21.50 (pbk.).

In its relatively short compass this volume is a lively nontechnical reader on the complex issues of intergenerational economic relations. The focus is the United States; the relations, principally, are those working through the public sector. The debate of the title is that between proponents of generational equity on the one hand and of generational interdependence on the other. The equity advocates decry the unfairness of the economic burden carried by the baby boom generation, required to finance the pay-as-you-go pensions of their elders but with no expectation that they themselves when retired will be similarly supported. They tend to be economic individualists, believing in personal responsibility and suspicious of government redistributive policies. They put store in individual retirement accounts over the Social Security trust fund. The interdependence supporters, in contrast, emphasize social solidarity: social relationships are (and should be) thickly meshed and it is arbitrary to single out age-based transfers from all the others in assessing fairness. Differences by class, ethnicity, and gender—issues of intragenerational equity—are usually more significant. Members of this second group tend to be communitarians. In particular, they reject as empirically false the depiction of an affluent elderly population using its political muscle to weaken public programs benefiting children—such as by voting down school bond issues. The contributions to the volume are organized into these two camps. Discussions of the Social Security “crisis,” generational accounting, and age-based health care rationing fall in the first; articles disputing the thrust or framing of those arguments in the second. An introductory chapter by Williamson and Watts-Roy gives a brief account of the politics and political history of the debate. Two final chapters present “Voices from Generation X” but add very little weight to the collection. All except two of the 13 chapters are previously published items, but many of them deriving from a scattered array of books and fugitive material. Most are of very recent vintage. The editors come from the fields of sociology and social work. Index.—G. McN.

The UN Population Division on Replacement Migration

The most salient demographic trend pictured by the influential set of population projections prepared by the Population Division of the United Nations (a unit in the UN's Department of Economic and Social Affairs) is the continuing substantial increase—albeit at a declining rate—of the global population during the coming decades. According to the “medium” variant of the most recent (1998) revision of these projections, between 2000 and 2050 the expected net addition to the size of the world population will be some 2.85 billion, a figure larger than that of the total world population as recently as the mid-1950s.

All of this increase will occur in the countries currently classified as less developed; in fact, as a result of their anticipated persistent below-replacement levels of fertility, the more developed regions as a whole would experience declining population size beginning about 2020, and would register a net population loss of some 33 million between 2000 and 2050.

A report prepared by the UN Population Division and released on 21 March 2000 addresses some of the implications of the changes in population size and age structure that low-fertility countries will be likely to experience. The 143-page report, issued under the eye-catching title Replacement Migration: Is It a Solution to Declining and Ageing Populations?, highlights the expected magnitude of these changes by the imaginative device of answering three hypothetical questions. The answer to each of these questions is predicated on the assumption that some specified demographic feature of various country or regional populations would be maintained at the highest level that feature would exhibit, in the absence of international migration, in the United Nations' medium population projections (as revised in 1998) during the period 1995–2050. The selected demographic features are total population size, the size of the working-age population (15–64 years), and the so-called potential support ratio: the ratio of the working-age population to the old-age population (65 years and older). The illustrative device chosen for accomplishing the specified feats of preserving the selected demographic parameters (i.e., keeping them unchanged up to 2050 once their highest value is attained) is international migration. Hence the term “replacement migration.”

Given the low levels of fertility and mortality now prevailing in the more developed world (and specifically in the eight countries and the two overlapping regions for which the numerical answers to the above questions are presented in the report), and given the expected future evolution of fertility and mortality incorporated in the UN population projections, the results are predictably startling. The magnitudes of the requisite compensatory migration streams tend to be huge relative both to current net immigration flows and to the size of the receiving populations; least so in the case of the migration needed to maintain total population size and most so in the case of migration needed to counterbalance population aging by maintaining the support ratio. Reflecting its relatively high fertility and its

past and current record of receiving a large influx of international migrants, the United States is a partial exception to this rule. But even for the US to maintain the support ratio at its highest—year 1995—level of 5.21 would require increasing net immigration more than tenfold. The country, the report states, would have to receive 593 million immigrants between 1995 and 2050, or a yearly average of 10.8 million. The extreme case is the Republic of Korea, where the exercise calls for maintaining a support ratio of 12.6. To satisfy this requirement, Korea, with a current population of some 47 million, would need 5.1 billion immigrants between 1995 and 2050, or an average of 94 million immigrants per year. (In the calculations, the age and sex distribution of migrants is assumed to be the same as that observed in the past in the main immigration countries. The fertility and mortality of immigrants are assumed to be identical with those of the receiving population.)

The “Executive Summary” of the report is reproduced below, with the permission of the United Nations. Chapters of the full report set out the issues that prompted the exercise; provide a selective review of the literature; explain the methodology and the assumptions underlying the calculations; and present the detailed results for the eight countries and two regions selected for illustrative purposes. A brief discussion of the implications of the findings concludes the report. As is evident even from the figures just cited, immigration is shown to be at best a modest potential palliative to whatever problems declining population size and population aging are likely to pose to low-fertility countries. The calculations, however, vividly illustrate that demographic changes will profoundly affect society and the economy, and will require adjustments that remain inadequately appreciated and assessed. The criteria specified in the UN calculations—maintenance of particular demographic parameters at a peak value—of course do not necessarily have special normative significance. Past demographic changes, with respect notably to the age distribution as well as population size, have been substantial, yet they have been successfully accommodated under circumstances of growing prosperity in many countries. But the past may be an imperfect guide in confronting the evolving dynamics of low-fertility populations. As the report convincingly states, the new demographic challenges will require comprehensive reassessments of many established economic and social policies and programs.

The United Nations Population Division monitors fertility, mortality and migration trends for all countries of the world, as a basis for producing the official United Nations population estimates and projections. Among the demographic trends revealed by those figures, two are particularly salient: population decline and population ageing.

Focusing on these two striking and critical trends, the present study addresses the question of whether replacement migration is a solution to declining and ageing populations. Replacement migration refers to the international migration that would be needed to offset declines in the size of population, the declines in the population of working age, as well as to offset the overall ageing of a population.

The study computes the size of replacement migration and investigates the possible effects of replacement migration on the population size and age structure for a range of countries that have in common a fertility pattern below the replacement level. Eight countries are examined: France, Germany, Italy, Japan, Republic of Korea, Russian Federation, United Kingdom and United States. Two regions are also included: Europe and the European Union. The time period covered is roughly half a century, i.e., from 1995 to 2050.

According to the United Nations population projections (medium variant), Japan and virtually all the countries of Europe are expected to decrease in population size over the next 50 years. For example, the population of Italy, currently 57 million, is projected to

decline to 41 million by 2050. The Russian Federation is expected to decrease from 147 million to 121 million between 2000 and 2050. Similarly, the population of Japan, currently 127 million, is projected to decline to 105 million by 2050.

In addition to the decrease in population size, Japan and the countries of Europe are undergoing a relatively rapid ageing process. In Japan, for example, over the next half century the median age of the population is expected to increase by some eight years, i.e., from 41 to 49 years. And the proportion of the Japanese population 65 years or older is expected to increase from its current 17 per cent to 32 per cent. Similarly in Italy, the median age of the population increases from 41 years to 53 years and the proportion of the population 65 years or older goes from 18 per cent to 35 per cent.

Building upon these estimates and projections, the present study considers five different scenarios with regard to the international migration streams needed to achieve specific population objectives or outcomes for the eight countries and two regions mentioned above. The five scenarios are:

Scenario I. The medium variant of the projections from the United Nations *World Population Prospects: 1998 Revision*.

Scenario II. The medium variant of the *1998 Revision*, amended by assuming zero migration after 1995.

Scenario III. This scenario computes and assumes the migration required to maintain the size of the total population at the highest level it would reach in the absence of migration after 1995.

Scenario IV. This scenario computes and assumes the migration required to maintain the size of the working-age population (15 to 64 years) at the highest level it would reach in the absence of migration after 1995.

Scenario V. This scenario computes and assumes the migration required to maintain the potential support ratio (PSR), i.e., the ratio of the working-age population (15 to 64 years) to the old-age population (65 years or older), at the highest level it would reach in the absence of migration after 1995.

The total and average annual numbers of migrants for the period 2000–2050 for each scenario are presented in table 1. Scenario I shows the numbers of migrants assumed for

the eight countries and two regions in the medium variant of the United Nations projections. For example, the total number of migrants for the United States for the fifty-year period is 38 million; and the average annual number is 760 thousand. Scenario II assumes zero migration for the entire period; the resulting populations and age structures are given in the text of this report.

Except for the United States, the numbers of migrants needed to maintain the size of the total population (scenario III) are considerably larger than those assumed in the medium variant of the United Nations projections (scenario I). In Italy, for example, the total number of migrants is 12.6 million (or 251 thousand per year) in scenario III versus 0.3 million (or 6 thousand per year) in scenario I. For the European Union, the respective numbers are 47 million versus 13 million (or 949 thousand per year versus 270 thousand per year).

In scenario IV, that is in order to keep constant the size of the working-age population (15 to 64 years), the numbers of migrants are even larger than those in scenario III. In Germany, for instance, the total number of migrants is 24 million (or 487 thousand per year) in scenario IV versus 17 million (or 344 thousand per year) in scenario III.

Figure 1 provides a standardised comparison by presenting the migration flows expressed in per million inhabitants in 2000. This comparison shows that relative to country size the number of migrants between 2000–2050 needed to maintain the size of the working-age population (scenario IV) is the highest for Italy, with 6,500 annual immigrants per million inhabitants, followed by Germany, with 6,000 annual immigrants per million inhabitants. Among the countries and regions studied in this report, the United States would require the smallest number of immigrants, approximately 1,300 per million inhabitants to prevent the decline of its working-age population.

The numbers in scenario V, which keeps the potential support ratio constant, are extraordinarily large. In Japan, for example, the total number of migrants in scenario V is 524 million (or 10.5 million per year). For the European Union, the total number of migrants in this scenario is 674 million (or 13 million per year).

TABLE 1 Net number of migrants by country or region and scenario, 2000–2050 (thousands)

Country or region	Scenario				
	I	II	III	IV	V
	Medium variant	Medium variant with zero migration	Constant total population	Constant age group 15–64	Constant ratio 15–64/65 years or older
A. Total number					
France	325	0	1,473	5,459	89,584
Germany	10,200	0	17,187	24,330	181,508
Italy	310	0	12,569	18,596	113,381
Japan	0	0	17,141	32,332	523,543
Republic of Korea	–350	0	1,509	6,426	5,128,147
Russian Federation	5,448	0	24,896	35,756	253,379
United Kingdom	1,000	0	2,634	6,247	59,722
United States	38,000	0	6,384	17,967	592,572
Europe	18,779	0	95,869	161,346	1,356,932
European Union	13,489	0	47,456	79,375	673,999
B. Average annual number					
France	7	0	29	109	1,792
Germany	204	0	344	487	3,630
Italy	6	0	251	372	2,268
Japan	0	0	343	647	10,471
Republic of Korea	–7	0	30	129	102,563
Russian Federation	109	0	498	715	5,068
United Kingdom	20	0	53	125	1,194
United States	760	0	128	359	11,851
Europe	376	0	1,917	3,227	27,139
European Union	270	0	949	1,588	13,480

Major findings of this study include:

—During the first half of the 21st century, the populations of most developed countries are projected to become smaller and older as a result of below-replacement fertility and increased longevity.

—In the absence of migration, the declines in population size will be even greater than those projected and population ageing will be more rapid.

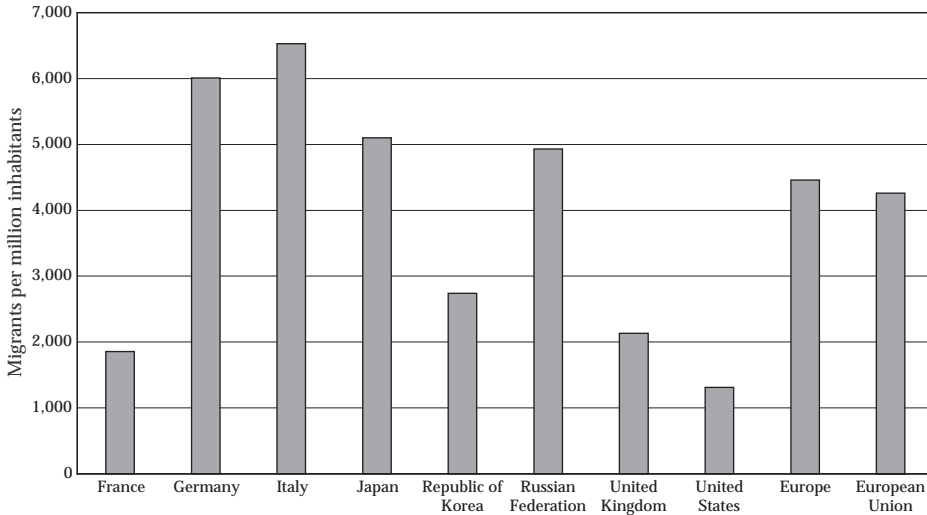
—Although fertility may rebound in the coming decades, few believe that fertility in most developed countries will recover sufficiently to reach replacement level in the foreseeable future, thus, making population decline inevitable in the absence of replacement migration.

—The projected population decline and population ageing will have profound and far-reaching consequences, forcing Governments to reassess many established economic, social and political policies and programmes, including those relating to international migration.

—For France, the Republic of Korea, United Kingdom and the United States, where fertility ranges from 1.7 to 2.0 children per woman, the level of immigration needed to prevent the total population from declining is relatively small in comparison to past national experience.

—For Germany, Italy, Japan, the Russian Federation, Europe and the European Union, where fertility varies from 1.2 to 1.4 children

FIGURE 1 Average annual net number of migrants between 2000–2050 to maintain size of working-age population per million inhabitants in 2000



per woman, a level of immigration much higher than experienced in the past would be needed to prevent the total population from declining.

—The numbers of migrants needed to offset declines in the working-age population are significantly larger than those needed to offset total population decline. Whether those larger numbers of migrants are within the realm of options open to Governments depends to a great extent on the social, economic and political circumstances of the particular country or region.

—If retirement ages remain essentially where they are today, increasing the size of the working-age population through international migration is the only option in the short to medium term to reduce declines in the potential support ratio.

—The levels of migration needed to offset population ageing (i.e., maintain potential support ratios) are extremely large, and in all cases entail vastly more immigration than occurred in the past.

—Maintaining potential support ratios at current levels through replacement migration

alone seems out of reach, because of the extraordinarily large numbers of migrants that would be required.

—In most cases, the potential support ratios could be maintained at current levels by increasing the upper limit to the working-age population to roughly 75 years of age.

—The new challenges being brought about by declining and ageing populations will require objective, thorough and comprehensive reassessments of many established economic, social and political policies and programmes. Such reassessments will need to incorporate a long-term perspective. Critical issues to be addressed in those reassessments would include: (a) the appropriate ages for retirement; (b) the levels, types and nature of retirement and health-care benefits for the elderly; (c) the labour-force participation; (d) the assessed amounts of contributions from workers and employers to support retirement and health-care benefits for the increasing elderly population; and (e) policies and programmes relating to international migration, in particular replacement migration.

The Limits to Low Fertility: A Biosocial Approach

CAROLINE FOSTER

In light of 30 years of below-replacement fertility in many industrialized societies, demographers are asking whether fertility could drop even further, or whether there is a “floor” below which it will not fall. A key unanswered question is whether there may be a variable biological component to fertility motivation which ensures that we continue to reproduce. Drawing on evidence from evolutionary biology, ethology, quantitative genetics, developmental psychobiology, and psychology, the article argues that our evolved biological predisposition is toward nurturing behaviors, rather than having children per se. Humans have the unique ability to be aware of such biological predispositions and translate them into conscious, but nevertheless biologically based, fertility motivation. It is likely that we have already reached the limits to low fertility since this “need to nurture,” in conjunction with normative pressures, ensures that the majority of women will want to bear at least one child. A sketch for a biosocial model of fertility motivation is outlined.

Relative Cohort Size: Source of a Unifying Theory of Global Fertility Transition?

DIANE J. MACUNOVICH

Using United Nations estimates of age structure and vital rates for 184 countries at five-year intervals from 1950 through 1995, this article demonstrates how changes in relative cohort size appear to have affected patterns of fertility across countries since 1950—not just in developed countries, but perhaps even more importantly in developing countries as they pass through the demographic transi-

tion. The increase in relative cohort size (defined as the proportion of males aged 15–24 relative to males aged 25–59), which occurs as a result of declining mortality rates among infants, children, and young adults during the demographic transition, appears to act as the mechanism that determines when the fertility portion of the transition begins. As hypothesized by Richard Easterlin, the increasing proportion of young adults generates a downward pressure on young men’s relative wages (or on the size of landholdings passed on from parent to child), which in turn causes young adults to accept a tradeoff between family size and material wellbeing, setting in motion a “cascade” or “snowball” effect in which total fertility rates tumble as social norms regarding acceptable family sizes begin to change.

Coresidential Patterns in Historical China: A Simulation Study

ZHONGWEI ZHAO

The controversy regarding China’s historical residential patterns is related to the lack of investigation into demographic influences on past kinship structures and household formation. This study uses computer microsimulation to examine demographic feasibility of people living in large multi-generation households under the demographic conditions close to those recorded in Chinese history. It investigates both the composition of households in which individuals live at a particular point in their life course and the transition in their household structure and the length of time they spend in households of different types. The simulation exercise suggests that demographic regimes and household formation systems similar to those operating in China in the past produce diverse residential patterns, in which individuals could experience different household forms at different stages of the life cycle.

Uncertain Aims and Tacit Negotiation: Birth Control Practices in Britain, 1925–50

KATE FISHER

Evidence from oral history interviews is used to suggest the need to reevaluate our understanding of the dynamics of fertility decisions and behavior in the first half of the twentieth century. Those interviewed stressed their vague and haphazard approach to contraceptive use, in sharp contrast to the dominant depiction in studies of fertility decline that emphasize the degree to which individuals made deliberate and calculated choices about family size based on an assessment of the costs and benefits of childrearing. Details of individual contraceptive strategies elucidate the complexities of birth control behavior: couples, lacking explicit aims for family limitation, adopted diverse methods of birth control, using them for different reasons, at different times, with varying degrees of determination and confidence and frequently with very little direct discussion or planning. Explicit articulation of aims was not a necessary prerequisite of the spread of birth control; accepted gender roles meant that responsibilities and obligations emerged gradually and tacitly. As a result, nevertheless, low fertility was effectively achieved.

Agricultural Adjustment in China: Problems and Prospects

D. GALE JOHNSON

Because of the low income elasticity of demand for farm products and the ability of

farmers to increase labor productivity, economic growth requires that farm employment decline if farmers are to share in the benefits of such growth. In 1952 approximately 84 percent of China's workers were engaged in agriculture; in 1997 the figure had declined to 41 percent. By 2030 farm employment may account for only 10 percent of the total. The productivity of farm labor must increase at a rapid pace if the 63 percent decline in farm employment does not adversely affect the rate of growth of farm output.

Crime, Gender, and Society in India: Insights from Homicide Data

JEAN DRÉZE
REETIKA KHERA

This study presents an analysis of inter-district variations in murder rates in India in 1981. Three significant patterns emerge. First, murder rates in India bear no significant relation with urbanization or poverty. Second, there is a negative association between literacy and criminal violence. Third, murder rates in India are highly correlated with the female–male ratio in the population: districts with higher female–male ratios have lower murder rates. Alternative hypotheses about the causal relationships underlying this connection between sex ratios and murder rates are scrutinized. One plausible explanation is that low female–male ratios and high murder rates are joint symptoms of a patriarchal environment. This study also suggests that gender relations, in general, have a crucial bearing on criminal violence.

Les limites à un taux faible de fécondité : perspective biosociale

CAROLINE FOSTER

Compte tenu des taux de fécondité insuffisants à la reproduction qu'ont connu un grand nombre de sociétés industrialisées au cours des 30 dernières années, les démogra-

phes se demandent si ces taux peuvent encore baisser ou s'il existe un point au-dessous duquel ils ne peuvent plus descendre. Existe-t-il une composante biologique variable à la motivation de fécondité qui garantisse la reproduction ? C'est là une question clé. À partir de preuves provenant de la biologie évolutionniste, l'éthologie, la génétique quantitative, la psychobiologie développe-

mentale et la psychologie, le présent article allègue que notre prédisposition biologique s'est développée davantage vers des comportements nourriciers que vers le simple besoin d'avoir des enfants. Les humains ont la capacité toute particulière d'être conscients de telles prédispositions biologiques et les expriment en mobiles axés sur la fécondité de façon consciente, même si elles sont biologiques. Il semble que nous ayons déjà atteint les limites du taux faible de fécondité étant donné que ce "besoin nourricier", de pair avec les pressions normatives, assure que la majorité des femmes désire avoir au moins un enfant. L'esquisse d'un modèle biosocial de motivation de fécondité est fournie.

Taille relative d'une cohorte : source d'une théorie unificatrice de la transition de fécondité à l'échelle mondiale ?

DIANE J. MACUNOVICH

À partir de prévisions des Nations Unies sur la structure par âge et les indices vitaux pour 184 pays, à des intervalles de cinq ans entre 1950 et 1995, le présent article démontre comment les changements dans la taille relative d'une cohorte semblent avoir eu une incidence sur les taux de fécondité dans différents pays depuis 1950. Ceci est particulièrement évident dans les pays développés mais aussi, et c'est encore plus pertinent, dans les pays en développement, lorsqu'ils font l'expérience de la transition démographique. L'augmentation de la taille relative d'une cohorte (définie comme étant la proportion des mâles âgés de 15 à 24 ans en relation avec les mâles âgés de 25 à 59 ans) qui se produit à la suite des taux de mortalité à la baisse chez les enfants en bas âge, les enfants et les jeunes adultes lorsque s'effectue la transition démographique, semble servir de mécanisme déterminant le moment où la portion fécondité de la transition commence. Selon l'hypothèse de Richard Easterlin, la proportion croissante des jeunes adultes génère une pression vers le bas sur les revenus relatifs des jeunes hommes (ou sur la taille des propriétés foncières transmises des parents aux enfants), ce qui incite les jeunes adultes à devoir faire un compromis entre le nombre d'enfants éven-

tuel et le bien-être matériel. Un effet de "cascade" ou de "boule de neige" s'ensuit, et le taux de fécondité totale baisse de façon dramatique au même moment où la norme collective à l'égard d'un nombre acceptable d'enfants dans une famille commence à changer.

Modèles corésidentiels en Chine traditionnelle : une étude en simulation

ZHONGWEI ZHAO

La controverse sur les modèles résidentiels traditionnels en Chine est reliée au manque de recherches quant aux influences démographiques sur les structures parentalistes et la formation des foyers dans le passé. La présente étude utilise la microsimulation informatique pour examiner la faisabilité démographique des personnes vivant dans des foyers où se côtoient plusieurs générations, dans des conditions démographiques qui ressemblent à celles de la Chine traditionnelle. On y examine la composition des foyers où les individus vivent à un moment donné de leur vie ainsi que la transition de la structure de leur foyer et le temps qu'ils passent dans différents types de foyers. L'exercice de simulation suggère que les régimes démographiques et les systèmes de formation des foyers semblables à ceux qui existaient en Chine traditionnelle produisent des modèles résidentiels divers dans lesquels les individus font l'expérience de différentes formes de foyers à des périodes différentes de leur cycle de vie.

Objectifs incertains et négociation tacite : les pratiques contraceptives en Grande-Bretagne, 1925-50

KATE FISHER

Les témoignages provenant d'entrevues d'histoire orale sont utilisés pour suggérer la réévaluation de notre compréhension de la dynamique des décisions et du comportement en matière de fécondité dans la première moitié du vingtième siècle. Les personnes qui ont été interrogées ont souligné que leur méthode d'utilisation de contracep-

tifs était vague et désordonnée. Ce témoignage contrastait de façon marquée avec la représentation qui prédominait dans les études sur la baisse de la fécondité, à savoir à quel point les individus font des choix délibérés et éclairés sur le nombre d'enfants qu'ils désirent à partir d'une évaluation des avantages et des coûts encourus pour élever des enfants. Des détails sur les stratégies contraceptives individuelles éclairent les complexités du comportement sur la contraception : des couples qui n'avaient pas d'objectifs explicites quant au nombre d'enfants désirés, ont adopté diverses méthodes contraceptives, les utilisant pour différentes raisons et à des périodes différentes, avec une détermination et une confiance variables, souvent sans discussion ou planification valables. L'articulation explicite des objectifs n'était pas nécessairement un prérequis de la transmission des méthodes contraceptives. Les responsabilités et les obligations associées au rôle assigné à chaque sexe sont apparues graduellement et tacitement. Il en résulte pourtant que le taux faible de fécondité a été atteint.

Rajustement agricole en Chine : problèmes et perspectives

D. GALE JOHNSON

Étant donné l'élasticité de la demande pour les produits agricoles à faible revenu et la capacité des fermiers à augmenter la productivité du travail, la croissance économique exige que le taux de l'emploi agricole baisse pour que les fermiers en partagent les retombées. En 1952, environ 84 pourcent des travailleurs chinois oeuvraient en agriculture.

En 1997, ce pourcentage n'était plus que de 41 pourcent. D'ici à 2030, il se pourrait que l'emploi agricole ne représente plus que 10 pourcent du total. La productivité des travailleurs agricoles doit augmenter de façon accélérée pour que la baisse de 63 pourcent de l'emploi agricole ne nuise pas au taux de croissance de la production agricole.

Crime, société et rapports des sexes en Inde: analyse des taux d'homicide

JEAN DRÈZE
REETIKA KHERA

Cette étude présente une analyse des variations inter-régionales du taux d'homicide en Inde en 1981. Trois résultats importants apparaissent. *Primo*, il n'y a pas de relation significative entre le taux d'homicide et l'urbanisation ou la pauvreté. *Secundo*, l'alphabetisation est liée de façon négative à la violence criminelle. *Tertio*, il y a une forte corrélation entre le taux d'homicide et le rapport des sexes dans la population: les districts avec une population plus féminine ont des taux d'homicide moins élevés. Diverses hypothèses concernant les causes de cette association entre le rapport des sexes et le taux d'homicide sont examinées. Une explication possible est qu'un taux d'homicide élevé et une faible proportion féminine dans la population (reflétant une préférence pour les garçons) sont deux symptômes conjoints d'un environnement patriarcal. De façon générale, le cas de l'Inde suggère que les relations entre les sexes ont une influence importante sur la violence criminelle.

Los límites de fecundidad baja: Un enfoque biosocial

CAROLINE FOSTER

En vista que muchas sociedades industrializadas han alcanzado niveles de fecundidad bajo reemplazo en los últimos 30 años, los demógrafos se preguntan si la fecundidad podría aún caer más, o si existe un "sue-

lo" bajo el cual no descendería. Una pregunta clave, sin contestarse, es si existe un componente biológico variable para la motivación de la fecundidad que asegure que continuaremos reproduciéndonos. Recurriendo a evidencias de la biología evolucionaria, etología, genética cuantitativa, psicobiología del desarrollo, y psicología, el artículo sostiene que nuestra evolucionada predisposición biológica es hacia comportamientos que

se relacionan a criar y nutrir más bien que a tener hijos intrínsecamente. Los humanos tienen la capacidad extraordinaria de darse cuenta de tales predisposiciones biológicas y de traducirlas a una motivación consciente de fecundidad, pero que sin embargo tiene base psicológica. Es posible que ya hayamos alcanzado los límites de fecundidad baja ya que esta “necesidad de criar y nutrir”, conjuntamente con presiones normativas, asegura que la mayoría de las mujeres van a querer dar a luz a por lo menos un hijo. Se esboza aquí un esquema para un modelo biosocial de motivación de la fecundidad.

Tamaño relativo de cohorte: ¿Fuente de una teoría unificadora de la transición de la fecundidad global?

DIANE J. MACUNOVICH

Usando estimaciones de las Naciones Unidas de estructuras por edad y tasas vitales para 184 países a intervalos de cinco años de 1950 hasta 1995, este artículo demuestra como los cambios en los tamaños relativos de las cohortes parecen haber afectado los patrones de fecundidad a través de los países desde 1950—no solamente en países desarrollados pero, quizás de aún mayor importancia, en los países en desarrollo a medida que éstos pasan por la transición demográfica. El aumento del tamaño relativo de una cohorte (definido como la proporción de varones de edad 15–24 relativo a los varones de edad 25–59), que se produce como resultado del descenso de las tasas de mortalidad entre bebés, niños, y adultos jóvenes durante la transición demográfica, parece actuar como mecanismo determinante de cuando se inicia la porción que ejerce la fecundidad en la transición. Según la hipótesis de Richard Easterlin, la creciente proporción de adultos jóvenes genera presiones hacia abajo sobre los sueldos relativos de los hombres jóvenes (o sobre el tamaño de las tierras que son transmitidas de padre a hijo), lo que a su vez causa que los adultos jóvenes acepten un intercambio entre el tamaño de su familia y el bienestar material, dando origen a un efecto de “cascada” o “bola de nieve” dentro del cual las tasas globales de fecundidad caen cuando las normas sociales respecto al tamaño aceptable de familia comienzan a mudar.

Patrones de coresidencia en la China histórica: Un estudio de simulación

ZHONGWEI ZHAO

La controversia respecto a los patrones históricos de residencia en China se relacionan a la carencia de investigación de las influencias demográficas sobre las estructuras anteriores de parentescos y de la formación de hogares. Una microsimulación usando un computador es empleada en este estudio para examinar la viabilidad demográfica de personas viviendo en hogares multigeneracionales de gran tamaño bajo condiciones demográficas que se aproximan a aquellas registradas en la historia china. Se investiga tanto la composición de los hogares en que viven los individuos en un punto dado de su curso de vida y la transición en la estructura de su hogar como la cantidad de tiempo que permanecen en hogares de diferentes tipos. El ejercicio de simulación sugiere que los regímenes demográficos y los sistemas de formación del hogar, parecidos a aquellos que existieron en China en el pasado, producen diversos patrones residenciales en los cuales individuos habrían experimentado diferentes formas de hogares en diferentes fases de su ciclo de vida.

Objetivos indeterminados y negociaciones tácitas: Prácticas de control de la natalidad en Gran Bretaña, 1925–50

KATE FISHER

Se usa en este artículo evidencia de entrevistas de historias orales para sugerir la necesidad de reevaluar nuestro entendimiento de las dinámicas de las decisiones de fecundidad y del comportamiento en la primera mitad del siglo veinte. Los entrevistados recalcaron su vaga y casual forma de abordar el uso de anticonceptivos, en fuerte contraste con la descripción dominante en los estudios del descenso de la fecundidad en los que se acentúa el grado en que los individuos hicieron una elección deliberada y calculada del tamaño de la familia basada en un examen de los costos y beneficios de criar niños. Los detalles de las estrategias individuales de anticoncepción ponen en claro la

complejidad del comportamiento de control de la natalidad: las parejas, a falta de metas explícitas para limitar la familia, adoptaron diversos métodos de control de la natalidad, usándolos por diferentes razones, a tiempos diferentes, con grados diversos de determinación y seguridad y frecuentemente con poquísima discusión directa o planeamiento. Detallada articulación de metas no fue prerequisite necesario de la propagación del control de la natalidad: la aceptación de nuevos papeles de los géneros significó que las responsabilidades y obligaciones surgieron gradualmente y tácitamente. El resultado, no obstante, fue una baja de la fecundidad que se logró eficazmente.

Ajustes agrícolas en China: Problemas y perspectivas

D. GALE JOHNSON

Debido al bajo nivel de ingresos la elasticidad en la demanda de productos agrícolas y la capacidad de los agricultores de aumentar la productividad laboral, el crecimiento económico requiere que se reduzca la fuerza de trabajo agrícola si los agricultores han de participar en los beneficios del crecimiento económico. En 1952 aproximadamente un 84 por ciento de los trabajadores de China trabajaban en faenas agrícolas, en 1997 la cifra había bajado a un 41 por ciento. Por el año 2030 el empleo agrícola podría abarcar tan sólo un 10 por ciento del total. La productividad de la mano de obra agrícola deberá

aumentar rápidamente si el descenso de un 63 por ciento en el empleo agrícola no afecta en forma adversa la tasa de crecimiento de la producción agrícola.

Crimen, género y sociedad en India: Observaciones de datos de homicidios

JEAN DRÉZE
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Este estudio presenta un análisis de las variaciones entre distritos en las tasas de asesinatos en India en 1981. Surgen tres patrones importantes. Primero, las tasas de asesinatos en India no presentan una importante relación con la urbanización o la pobreza. Segundo, hay una asociación negativa entre el nivel de alfabetización y la violencia criminal. Tercero, las tasas de asesinato en India tienen alta correlación con la razón femenina-varón de la población: distritos con una razón más alta femenina-varón tienen tasas más bajas de asesinatos. Se examinan las hipótesis alternativas sobre las relaciones causales que subyacen esta conexión entre índices de masculinidad y tasas de asesinatos. Una probable explicación es que las bajas razones femenina-varón y las altas tasas de asesinatos son síntomas de un medio ambiente patriarcal. Este estudio sugiere también que las relaciones de género, en general, ejercen una influencia crucial sobre la violencia criminal.

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